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NATIONAL DAM SAFETY PROGRAM. MISHE - MOKWA DAM (NJ 00419), DELA--ETC(U)
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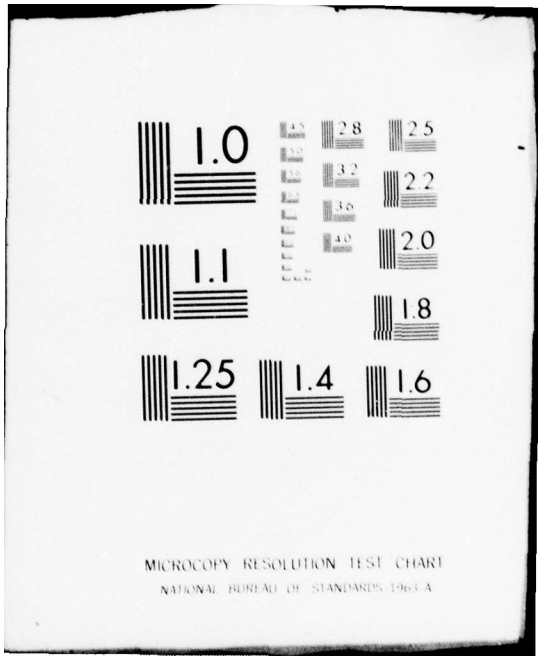
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DELAWARE RIVER BASIN
HAYNES CREEK TRIBUTARY
BURLINGTON COUNTY
NEW JERSEY

MISHE - MOKWA DAM
NJ 00419

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Approved for public release;
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DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

May 1979

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18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams	Safety
Embankments	Visual Inspection
Spillway	National Dam Inspection Report
Structural Analysis	Mishe-Mokwa Dam, N.J.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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IN REPLY REFER TO

NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

7 MAY 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Mishe-Mokwa Dam in Burlington County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Mishe-Mokwa Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 65 percent of the Spillway Design Flood - SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood). To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980.

b. Within three months from the date of approval of this report, engineering studies and analyses should be performed to monitor the seepage by visual observation in order to determine its effect on the structural stability of the dam. If necessary, measurements should be made by the use of appropriate instrumentation. The monitoring should be performed on a monthly basis. A detailed topographic survey of the dam and the areas around the dam should also be made and become part of the permanent records of the dam. Remedial measures to correct the poten-

tial inundation of the two houses adjacent to the low area in the beach should also be studied. Any remedial measures found necessary should be initiated within calendar year 1980.

c. The following remedial actions should be completed within six months from the date of approval of this report:

(1) Trees and brush on the dam embankment should be removed. Trees should be cut at the ground surface and brush removed in a way that will cause minimal disturbance to the embankment.

(2) The eroded areas on the dam embankment should be properly filled and compacted. The drainage system for the road should be corrected to prevent future erosion. Such work should be done immediately after the trees and brush have been removed.

(3) A good stand of grass should be established on all surfaces of the embankment.

(4) The concrete spillway and discharge culvert should be thoroughly inspected and repaired as required.

(5) The stilling basin area should be cleaned of accumulated debris.

The owner of the dam should initiate a program of periodic inspection and maintenance. A visual inspection of the dam and appurtenances should be made annually and reported on a standardized check list form. Repairs should be made when required and the following maintenance should be performed annually: remove vegetation from the embankment, fill any eroded surfaces of the embankment and clear the downstream channel. In addition, the practice of lowering the lake annually for maintenance purposes should be continued and at least once every five years the submerged portions of the dam and spillway should be inspected and repaired while the lake is drawn down.

NAPEN-D
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Edwin B. Forsythe of the Sixth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
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N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

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MISHE-MOKWA DAM (NJ00419)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 12 December 1978 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Mishe-Mokwa Dam, a high hazard potential structure, is judged to be in fair overall condition. The dam's spillway is considered inadequate since 65 percent of the Spillway Design Flood - SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood). To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980.

b. Within three months from the date of approval of this report, engineering studies and analyses should be performed to monitor the seepage by visual observation in order to determine its effect on the structural stability of the dam. If necessary, measurements should be made by the use of appropriate instrumentation. The monitoring should be performed on a monthly basis. A detailed topographic survey of the dam and the areas around the dam should also be made and become part of the permanent records of the dam. Remedial measures to correct the potential inundation of the two houses adjacent to the low area in the beach should also be studied. Any remedial measures found necessary should be initiated within calendar year 1980.

c. The following remedial actions should be completed within six months from the date of approval of this report:

(1) Trees and brush on the dam embankment should be removed. Trees should be cut at the ground surface and brush removed in a way that will cause minimal disturbance to the embankment.

(2) The eroded areas on the dam embankment should be properly filled and compacted. The drainage system for the road should be corrected to

prevent future erosion. Such work should be done immediately after the trees and brush have been removed.

(3) A good stand of grass should be established on all surfaces of the embankment.

(4) The concrete spillway and discharge culvert should be thoroughly inspected and repaired as required.

(5) The stilling basin area should be cleaned of accumulated debris.

The owner of the dam should initiate a program of periodic inspection and maintenance. A visual inspection of the dam and appurtenances should be made annually and reported on a standardized check list form. Repairs should be made when required and the following maintenance should be performed annually: remove vegetation from the embankment, fill any eroded surfaces of the embankment and clear the downstream channel. In addition, the practice of lowering the lake annually for maintenance purposes should be continued and at least once every five years the submerged portions of the dam and spillway should be inspected and repaired while the lake is drawn down.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 2 May 1979

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Mishe-Mokwa Dam, I.D. NJ00419
State Located:	New Jersey
County Located:	Burlington
Drainage Basin:	Delaware
Stream:	Tributary to Haynes Creek
Date of Inspection:	December 12, 1978

Assessment of General Condition of Dam

Based on visual inspection, past operational performance and Phase I engineering analyses, Mishe-Mokwa Dam is assessed as being in fair overall condition.

Hydraulic and hydrologic analyses indicate that the spillway is inadequate. Discharge from the spillway and from a low area of the lake shore adjacent to the dam is not sufficient to pass the designated spillway design flood (SDF) without overtopping of the dam. (The SDF for Mishe-Mokwa Dam is equal to one-half the probable maximum flood.) The spillway, together with the low area adjacent to the dam, can pass approximately 32 percent of the probable maximum flood. Therefore, the owner should engage a qualified professional engineer soon to perform accurate hydraulic and hydrologic analyses relating to the spillway capacity. Based on the findings of the analyses, the dam and spillway should be modified to prevent overtopping of the dam resulting from a storm equivalent to the SDF.

Two zones of seepage are present on the downstream face and toe of embankment. Arrangements should be made soon to monitor the seepage on a monthly basis in order to determine its effect on the structural stability of dam.

Two houses appear to be located in the downstream flood plain of the low area adjacent to the dam. Any discharge from the lake over the low area could effect the two houses. Remedial measures to correct this condition should be initiated soon.

The spillway appears to be in good condition. However, in the near future, it should be thoroughly inspected and renovated by sand blasting, grouting where needed and coating with epoxy.

The spillway discharge culvert, although appearing structurally sound, contains some deterioration which should be repaired in the near future.

The stilling basin downstream of the spillway discharge culvert contains debris that should be removed in the near future.

The embankment is generally free of settlement and appears to be structurally sound. However, trees and brush as well as erosion are present on its surface. These conditions should be repaired in the near future and thereafter maintained. Repairs include the removal of trees and brush, the filling of eroded areas, the establishment of a grass cover and the correction of the roadway drainage system.

The owner should, in the near future, implement a program of periodic inspection and maintenance for the dam which would include a topographic survey to provide a record of existing conditions. Repairs should be made when required and the following maintenance should be performed annually: remove trees and brush from the embankment,

fill any eroded surfaces of the embankment and clear the downstream channel. In additon, the practice of lowering the lake annually for maintenance purposes should be continued and at least once every five years the submerged portions of the dam and spillway should be inspected and repaired while the lake is drawn down.

Richard J. McDermott

Richard J. McDermott, P.E.

OVERVIEW - MISHE - MOKWA DAM

12 DEC. 1978

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 30214. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

MISHE-MOKWA DAM, I.D. NJ00419

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of Mishe-Mokwa Dam was made on December 12, 1978. The purpose of the inspection was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

Mishe-Mokwa Dam is an earthfill dam with a concrete box drop-inlet spillway. The spillway, which is covered with a metal grate, functions in both controlled and uncontrolled modes as follows: 1. the sides of the drop inlet form an uncontrolled weir and 2. a slot at the upstream end of the spillway is fitted with timber stoplogs forming a controlled weir. The embankment is sandy and grass covered with brush and trees on its downstream face and a paved road on its crest.

The stoplogs forming the controlled weir of the spillway can also be used as outlet works to drain the lake.

Having an overall crest length of 165 feet, the embankment extends southeast to a wooden dock beyond which a public beach extends along the northeast edge of Lake Mishe-Mokwa. The beach lies between the lake and the same road that runs along the dam crest. In the vicinity of the beach, the road elevation is approximately 0.9 feet above normal lake level while along the crest of dam the road elevation is approximately 2.1 feet above normal lake level. Thus, the lake shore is lower in the beach area than is the crest of dam, allowing high water levels to flow overland before overtopping the dam. A complete hydraulic analysis is contained in Appendix 4.

The spillway has dimensions 3.6' x 6.0' with stoplogs 2.4 feet long. Thus, the concrete weir crest length is 13.2 feet and the timber weir crest length is 2.4 feet. The spillway crest lies 2.3 feet below the elevation of the dam crest and 10.6 feet above the elevation of the downstream channel bottom.

Extending upstream of the main impoundment of Mishe-Mokwa Dam are three finger-like projections of water each of which consists of two or more impoundments separated by road embankments and connected by discharge structures similar to the subject spillway. The normal water level elevation of each impoundment is higher than that of its adjacent downstream impoundment, creating a "stepped" series of impoundments. A bypass channel has been constructed along the northwest shore of Lake Mishe-Mokwa connecting the first upstream stepped impoundment with the downstream channel of Mishe-Mokwa Dam. See Hydraulic computations, Appendix 4. A discharge structure at the downstream end of the bypass channel outlets to the downstream channel. This structure, together with its discharge pipe, is not considered to be an appurtenance of the dam.

A water pump is located on the downstream face of embankment near the stilling basin and is used at times of low flow to pump water from the stilling basin to one of the upstream impoundments to recharge the lake.

b. Location

Mishe-Mokwa Dam is located in the Borough of Medford Lakes, Burlington County, New Jersey. Also known as Beach 3 Dam, it impounds Lake Mishe-Mokwa which forms the recreation center of a densely populated section of Medford Lakes. Water outflowing from the dam passes into Ballinger Lake and then through a series of lakes and eventually into Haynes Creek. Principal access to the dam is provided by the local road forming its crest.

c. Size and Hazard Classification

Size and Hazard Classification criteria presented in "Recommended Guidelines for Safety Inspection of Dams," published by the U. S. Army Corps of Engineers are as follows:

SIZE CLASSIFICATION

	IMPOUNDMENT	
Category	Storage (Ac-Ft)	Height (Ft)
Small	< 1000 and ≥ 50	< 40 and ≥ 25
Intermediate	≥ 1000 and < 50,000	≥ 40 and < 100
Large	≥ 50,000	≥ 100

HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life (Extent of Development)	Economic Loss (Extent of Development)
Low	None expected (No permanent structures for human habitation	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than few	Excessive (Extensive community, industry or agriculture)

The characteristics of Mishe-Mokwa Dam are:

Storage = 54 acre-feet

Height = 13 feet

Potential Loss of Life: Approx. 25 homes within 1600 feet of dam in flood plain as delineated by SDF outflow.

Potential Economic Loss: Sewage treatment plant, two road bridges within 3500 feet of dam.

Therefore, Mishe-Mokwa Dam is classified as "Small" size and "High" hazard potential.

d. Ownership

Mishe-Mokwa Dam is owned by the Medford Lakes Colony Club, Tecumsek Trail, Medford Lakes, New Jersey 08055.

e. Purpose of Dam

The purpose of the dam is the impoundment of a recreational lake facility.

f. Design and Construction History

The dam reportedly was constructed prior to 1900 and until approximately 1950 was used to impound cranberry bogs. The residential development surrounding Lake Mishe-Mokwa was constructed in or about 1950 and the

present concrete spillway was constructed approximately 10 years later. The contractor reportedly was the Hill Construction Company of Mt. Holly.

g. Normal Operational Procedures

The dam and appurtenances are maintained by Medford Lakes Colony Club while the road is maintained by the Borough of Medford Lakes. Regularly scheduled maintenance consists of the following: 1. Each spring the lake is lowered 3 to 4 feet at which time the gate is repaired, the lake cleaned and docks along the lake repaired. The lake lowering reportedly requires one week to accomplish. 2. Periodically, new turf is replaced where the embankment erodes away.

1.3 Pertinent Data

a. Drainage Area - 0.83 square miles

b. Discharge at Damsite

Maximum known flood at damsite	Unknown
Outlet works at pool elevation	150 c.f.s.
Diversion tunnel low pool outlet at pool elevation	N.A.
Diversion tunnel outlet at pool elevation	N.A.
Gated spillway capacity at pool elevation	0 c.f.s.
Gated spillway capacity at maximum pool elevation	160 c.f.s.
Ungated spillway capacity at maximum pool elevation	N.A.

Lake overflow (beach area)	684 c.f.s.
Total spillway capacity at maximum pool elevation	844 c.f.s.

c. Elevation (Feet above MSL)

Top of Dam	72.4
Maximum pool-design surcharge	72.9
Full flood control pool	N.A.
Recreation pool	70.3
Spillway crest	70.1
Lake overflow (beach area)	71.2
Stream bed at centerline of dam	59.5
Maximum tailwater	63± (Estimated)

d. Reservoir

Length of maximum pool	1,000 feet (irregular)
Length of recreation pool	1,000 feet (irregular)
Length of flood control pool	N.A.

e. Storage (Acre-feet)

Recreation pool	27 acre-feet
Flood control pool	N.A.
Design surcharge (Elev.72.9)	61 acre-feet
Top of dam (Elev. 72.4)	54 acre-feet

f. Reservoir Surface (Acres)

Top of dam	14 acres (estimated)
Maximum pool	15 acres (estimated)
Flood control pool	N.A.
Recreation pool	11 acres
Spillway crest	11 acres

g. Dam

Type	Earthfill
Length	165 feet
Height	13 feet
Sideslopes - Upstream	2 horiz. to 1 vert.
- Downstream	2 horiz. to 1 vert.
Zoning	Unknown
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Diversion and Regulating Tunnel — N.A.

i. Spillway

Type	Drop Inlet
Length of weir	15.6 feet
Crest elevation	70.1
Gates	Timber Stoplogs 2.4' long
Upstream channel	N.A.
Downstream channel	3.5' x 4' conc. arch culvert

j. Regulating Outlets

Timber stoplogs 2.4' long.

SECTION 2: ENGINEERING DATA

2.1 Design

No plans or calculations pertaining to either the original dam or the reconstructed spillway could be obtained.

2.2 Construction

No records are available pertaining to the construction of either the original dam or the reconstruction of the spillway in or about 1950.

2.3 Operation

No records of operation of the lake or dam are available. Normal operation of the dam and appurtenances reportedly consists of the following: 1. Water is pumped from the downstream channel of the dam to one of the impoundments upstream of the main lake to provide recharge during times of low flow. 2. The spillway stoplogs are pulled out each spring to lower the lake for maintenance purposes. The stoplogs are not pulled at the time of storm occurences.

2.4 Evaluation

a. Availability

Engineering information pertaining to the design of either the original dam or the reconstruction of the spillway is not available.

The only engineering information available is the elevation of a bench mark located on the spillway headwall. The elevation, which appears to correspond to USGS datum, is on file at the Borough of Medford Lakes maintenance garage.

b. Adequacy

Available engineering data pertaining to Mishe-Mokwa Dam is not adequate to be of significant assistance to the performance of a Phase I evaluation. A list of absent information is included in paragraph 7.1.b.

c. Validity

The validity of engineering data cannot be assessed due to the absence of data.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspection of Mishe-Mokwa Dam took place on December 12, 1978 by members of the staff of Storch Engineers. A copy of the visual inspection check list is contained in Appendix 1. The following procedures were employed for the inspection:

1. The embankment of the dam, appurtenant structures and adjacent areas were examined.
2. Areas of suspected seepage were noted and located.
3. The embankment and appurtenant structures were measured and key elevations at the first upstream impoundment were determined by hand level.
4. The embankment and appurtenant structures and adjacent areas were photographed.
5. A member of the maintenance staff of Medford Lakes Borough was present to assist in the inspection.

b. Dam

The dam embankment crest appeared to be level, with a slightly curved horizontal alignment. A paved road lies on the crest and was found to be in good condition.

Erosion was noted along sections of the upstream and downstream faces of the embankment, especially on the downstream face. No riprap was observed. Generally sandy in surface composition, the embankment contains some grass on its upstream face and grass, brush and trees on its downstream face.

Two seepage zones were noted on the downstream face of the embankment. A wet area was observed on the downstream face in the vicinity of the east wingwall of the discharge culvert. Seepage was observed at the embankment toe approximately 60 feet east of the spillway. Discharging in the form of a slight trickle, the seepage flows into a small drainage ditch running along the embankment toe into the stilling basin.

No evidence of cracking or settling was noted in the dam nor were any animal holes observed.

The generalized soils description of the dam site consists of stratified materials, predominantly silty sand and narrowly graded sand, deposited during the Tertiary period and designated on the Geologic map of New Jersey prepared by Lewis and Kummel as Kirkwood Sands. Composed on the average of varying percentages of very fine to coarse quartz sand, the Kirkwood Sands are overlain in the area of the lake by recently deposited stratified, swampy alluvium.

Bedrock is in excess of 100 feet below the ground surface. It is assumed that the dam is founded on the silty sands of the Kirkwood formation.

c. Appurtenant Structures

The crest of the spillway appeared uniformly aligned although a major part of it was submerged by overflow at the time of inspection. Water was flowing over the concrete weir section of the spillway and, therefore, the condition of much of the structure was not clearly observed. In general, the concrete as well as the steel grate and timber stoplogs appeared to be in good condition.

The spillway discharge culvert is generally in satisfactory condition although the concrete is deteriorated at its outlet end. The concrete of the discharge culvert headwall and wingwalls is in satisfactory condition with some minor cracks and spalls.

d. Reservoir Area

Lake Mishe-Mokwa is an irregularly shaped lake located in a densely populated residential area. Its shores range from less than 1% to 10% with an average slope of approximately 4%. A few docks are located along the edge of the lake where residential development has taken place. A 200-foot long section of the shore has a maximum elevation above the lake approximately 1.2 feet lower than the elevation of the dam crest. Thus, a 200-foot section of the lake will be overtopped by high water levels before the dam is overtopped.

e. Downstream Channel

The downstream channel of Mishe-Mokwa Dam is a narrow lake (Ballinger Lake) with no significant obstructions, although some debris was observed in the stilling basin area. Both banks are moderately steep and wooded and support residential development. In the vicinity of the dam, the lake is wider than it is further downstream forming a stilling basin for the spillway discharge.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in Lake Mishe-Mokwa normally is regulated naturally by discharge over the concrete weir sections of the spillway of Mishe-Mokwa Dam. Each spring, the stoplogs are removed in order to lower the lake for maintenance purposes. Reportedly, approximately one week is required to lower the lake 3 to 4 feet. During periods of low flow, water is pumped from the stilling basin to one of the upstream impoundments on the west side of the lake in order to recharge the lake volume. The level of water in the lake is further regulated by the series of embankments upstream of the main dam. Stoplog boards reportedly are not removed at times of intense storms.

4.2 Maintenance of the Dam

The dam generally is maintained by periodically replacing turf on the embankment where erosion has taken place. Also, the lake is lowered on an annual basis at which time the gate is repaired, the lake cleaned and docks repaired. There is no other program of regular inspection and maintenance; additional maintenance is performed as needed.

4.3 Maintenance of Operating Facilities

Maintenance of operating facilities, such as the recharge pump is performed as needed.

4.4 Description of Any Warning System in Effect

Reportedly, telephone communication is maintained between persons responsible for dams in the Medford Lakes area and the Civil Defense representatives in Medford Lakes Borough.

4.5 Evaluation of Operational Adequacy

The operation of the dam, together with the upstream embankments has been successful to the extent that the dam has not been overtopped since the present spillway was constructed.

Although maintenance documentation is poor, the adequacy of the maintenance program for the dam appears to have been fair. The spillway and roadway are in good condition. Some areas of maintenance have not been adequately performed, such as the following:

1. Trees and brush allowed to grow on downstream side of the embankment.
2. Erosion of embankment not adequately treated.
3. Deteriorated concrete of discharge culvert not repaired.
4. Bare soil on embankment allowed to remain without new grass.
5. Debris allowed to accumulate in stilling basin.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The intensity of storm water runoff that the spillway should be able to handle is based on the size and hazard classification of the dam. This runoff intensity, called the spillway design flood (SDF), is described in terms of frequency or probable maximum flood (PMF) depending on the extent of the dam's size and potential hazard. According to the "Recommended Guidelines for Safety Inspection of Dams", published by the U.S. Army Corps of Engineers, the SDF for Mishe-Mokwa Dam falls in a range of 1/2 PMF to PMF. In this case, the low end of the range, 1/2 PMF, is chosen since the factors used to select size and hazard classification are on the low side of their respective ranges.

The SDF peak inflow calculated for Mishe-Mokwa Dam is 2031 cfs. This value is derived from the 1/2 PMF hydrograph computed by the HEC-1-DB Flood Hydrograph Computer Program. Detailed hydrologic computations and computer output are contained in Appendix 4.

Discharge capacities for Mishe-Mokwa Dam were computed by considering two points of outflow from the lake: the spillway and the low area in the beach adjacent to the dam. The spillway was assumed to have the combined characteristics of a broad crested weir with breadth equal to 1 foot (concrete weir) and a sharp crested weir (stoplogs). The combined discharge with water level at

the dam crest was computed to be 160 cfs. The low area adjacent to the spillway was assumed to be a broad crested weir with c=2.63. Discharge over the low area with water level at the dam crest was computed to be 684 cfs.

In routing the SDF through the impoundment of the dam, the separate impoundments upstream of the main lake were considered to be one continuous lake. (See Appendix 4.) During a typical storm, these impoundments tend to attenuate the flow reaching the main lake. In routing the SDF, it was found that the dam would be overtopped by a depth of 0.5 foot over the dam crest and that the low area adjacent to the dam would be overtopped by a depth of 1.7 feet.

A breach analysis indicates that dam failure from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist without overtopping failure. Accordingly, the subject spillway is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

According to a member of the staff of the Medford Lakes maintenance department, the dam has not overtopped during the past 12 years nor has the low area of the lake adjacent to the dam been overtopped during that period of time. This experience tends to support the concept of an attenuative effect of the impoundments upstream from the main lake.

c. Visual Observations

No evidence was found at the time of inspection that would indicate previous overtopping of the dam or adjacent low area.

Two homes appear to be in the downstream flood plain of the low area adjacent to the dam, although an accurate determination of the limits of the flood plain cannot be made without further investigations. The homes are not in the flood plain of the dam and are not among those mentioned in paragraph 1.2.c. However, they could be effected by any overtopping of the low area (beach).

d. Overtopping Potential

As indicated in paragraph 5.1.a, a storm of magnitude equivalent to the SDF would cause overtopping of the dam to a height of 0.5 foot. Computations indicate that the dam can pass approximately 32 percent of the PMF without overtopping of the dam crest. In addition, the dam can pass approximately 8 percent of the PMF without overtopping of the low area (beach) adjacent to the dam.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual observations

The embankment appeared, at the time of inspection, to be structurally stable with no evidence of cracks, displacement or differential settlement. However, the visual inspection disclosed two zones of seepage through the dam as described in paragraph 3.1.b.

An accurate determination of the severity of the seepage depends on several factors, one of which is periodic observation. The severity of the seepage noted at Mishe-Mokwa Dam cannot be precisely determined at the present time.

b. Design and Construction Data

The analysis of structural stability and construction data for the embankment are not available.

c. Operating Records

There are no operating records available for the dam. The water level of Lake Mishe-Mokwa is not monitored.

d. Post Construction Changes

Since the spillway was constructed at Mishe-Mokwa Dam in or about 1960, there have been few changes to the dam or the area surrounding it that could have any significant effect on its structural integrity. The only evidence

for the possibility of such a change is the existence of the bypass channel adjacent to the west side of the lake. The construction of the channel required excavation in the vicinity of the dam.

e. Seismic Stability

Mishe-Mokwa Dam is located in seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams" which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if stable under static loading conditions. Mishe-Mokwa Dam appeared to be stable at the time of inspection.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Mishe-Mokwa Dam is considered to be inadequate.

The structural integrity of the dam appears to be adequate based on field investigations; the seepage is not considered to be an immediate indication of instability. No reported nor written evidence was found that would contradict that assessment.

b. Adequacy of Information

Information was gathered from several sources, including: 1. field investigation, 2. USGS quadrangle sheet, 3. aerial photography from Burlington County, and 4. consultation with staff members of Medford Lakes maintenance department. The information obtained is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams".

Some of the absent data are as follows:

1. Hydraulic and structural analyses of the dam and appurtenances.
2. Hydraulic data pertaining to the impoundments upstream of the main lake.
3. Stream and lake elevation gauging records.

4. Plans of the dam and appurtenances.
5. Description of the dam fill materials.
6. Inspection reports.

c. Necessity for Additional Data/Evaluation

Additional evaluation is considered necessary in order to assess the effect of the observed seepage on the structural integrity of the dam. The evaluation should be based on monitoring of the seepage as outlined in paragraph 7.2.c.

To provide an adequate record of existing conditions at the dam, a topographic survey should be undertaken as outlined in paragraph 7.2.c.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a., the spillway is considered to be inadequate. It is therefore recommended that a qualified professional engineer be engaged soon to perform more accurate hydraulic and hydrologic analyses relating to the spillway capacity. The analyses should more accurately determine runoff characteristics of the watershed, including the effect of the impoundments upstream of Lake Mishe-Mokwa and should refine the discharge capacity of the spillway and the downstream channel capacity.

Based on the findings of these analyses, the dam and spillway should be modified to prevent overtopping of the

dam resulting from a storm equivalent to the SDF. The following alternatives should be considered:

1. Improve the present spillway to accommodate the routed SDF flow rates.

2. Construct additional outlet facilities in the form of auxiliary spillways and emergency spillways.

Based on investigations made in connection with this report, it is evident that in the event that the low area (beach) adjacent to the dam is overtopped, two houses in its vicinity could be innundated. Remedial measures to correct this adverse condition should be initiated soon. Three alternative remedial measures are presented:

1. Improve the downstream channel of the low area to direct flow around the two homes.
2. Raise the crest of the low area in order to eliminate its overtopping. This alternative would necessitate a re-evaluation of the spillway adequacy.
3. Remove the homes in the downstream flood plain of the low area (beach).

It is further recommended that the following measures be undertaken by the owner in the near future.

1. Trees and brush on the dam embankment should be removed. Trees should be cut at the ground surface and brush removed in a way that will cause minimal disturbance to the embankment.

2. The eroded areas on the dam embankment should be properly filled and compacted. The drainage system for the road should be corrected to prevent future erosion. Such work should be done immediately after the trees and brush have been removed.
3. A good stand of grass should be established on all surfaces of the embankment.
4. The concrete spillway and discharge culvert should be thoroughly inspected and repaired as outlined below:

    a. Drain the lake to an elevation equal to the invert of the stoplogs.
    b. Sand blast all concrete and pressure grout any major cracks and patch all spalls and eroded surfaces.
    c. Apply an epoxy preservative coating to all surfaces.
5. The stilling basin area should be cleaned of accumulated debris.

The implementation of the above measures will require proper detailed design and the obtaining of applicable DEP approvals.

b. Maintenance

The owner of the dam should initiate in the near future a program of periodic inspection and maintenance, the complete records of which to be kept on file and made available to the public. A visual inspection of the dam and appurtenances by a qualified professional engineer should be made annually and reported on a standardized

check-list form. Repairs should be made when required and the following maintenance should be performed annually: remove vegetation from the embankment, fill any eroded surfaces of the embankment and clear the downstream channel. In addition, the practice of lowering the lake annually for maintenance purposes should be continued and at least once every five years the submerged portions of the dam and spillway should be inspected and repaired while the lake is drawn down.

c. Additional Studies

Arrangements should be made soon to monitor the seepage by visual observation in order to determine its effect on the structural stability of the dam. If necessary, measurements should be made by the use of appropriate instrumentation. The monitoring should be performed on a monthly basis by a qualified professional engineer.

A detailed topographic survey of the dam and the areas around the dam should be undertaken in the near future by a qualified licensed land surveyor or professional engineer. The survey should become part of the permanent records of the dam mentioned in paragraph 7.2.b.

PLATES

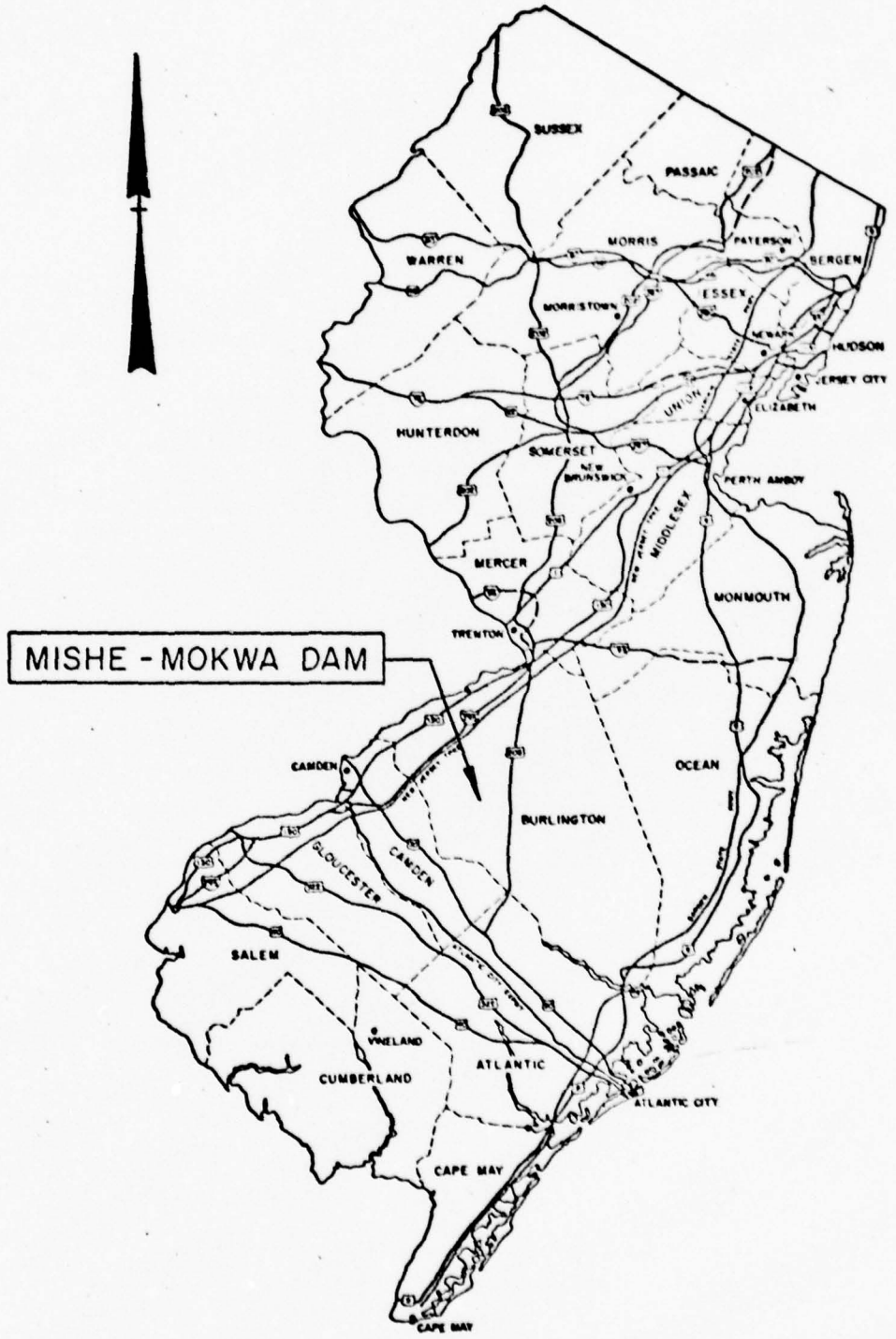


PLATE 1

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS KEY MAP MISHE - MOKWA DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	I.D.N.J. 00419
	SCALE: NONE
	DATE: FEBRUARY, 1979

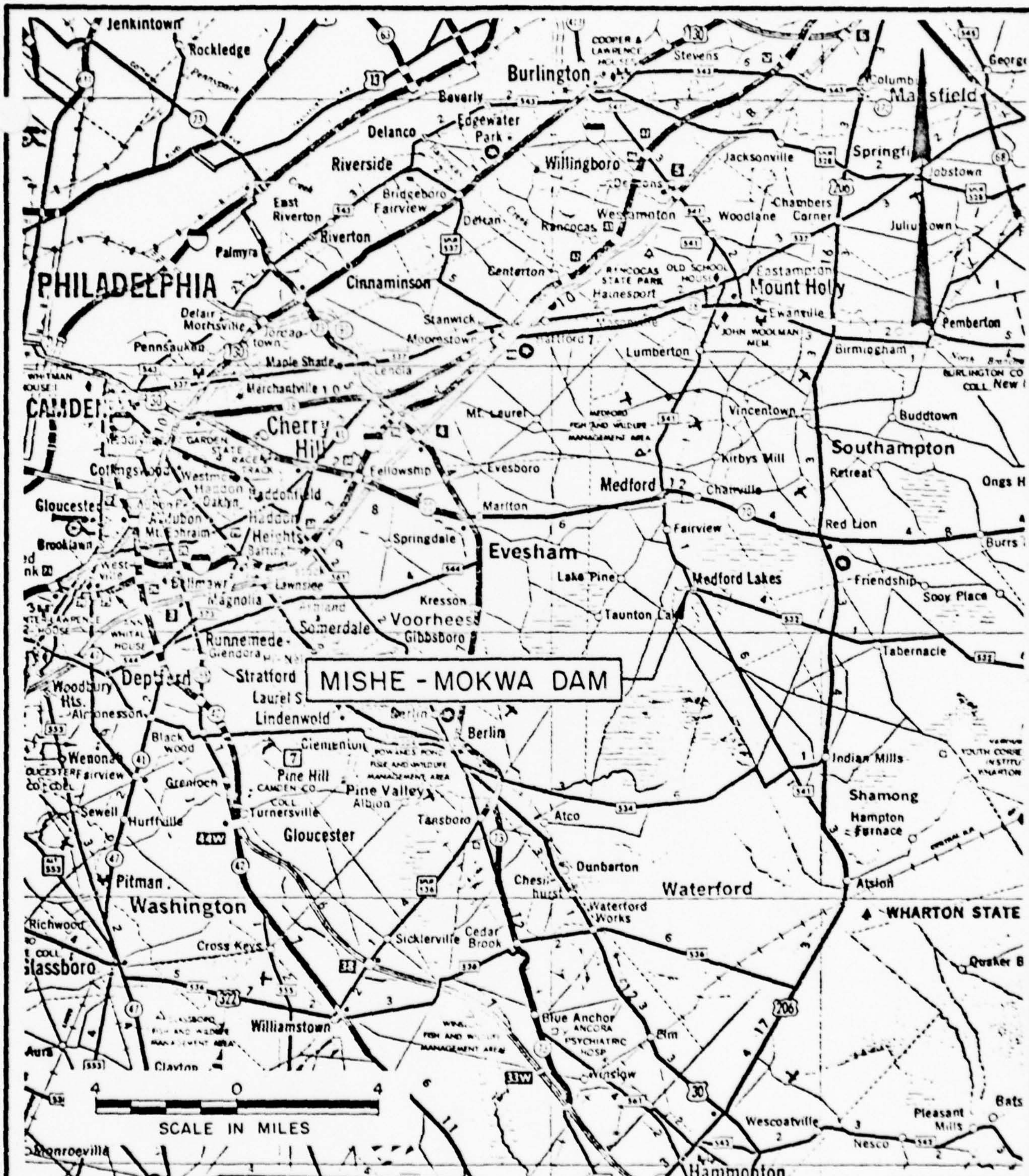


PLATE 2

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

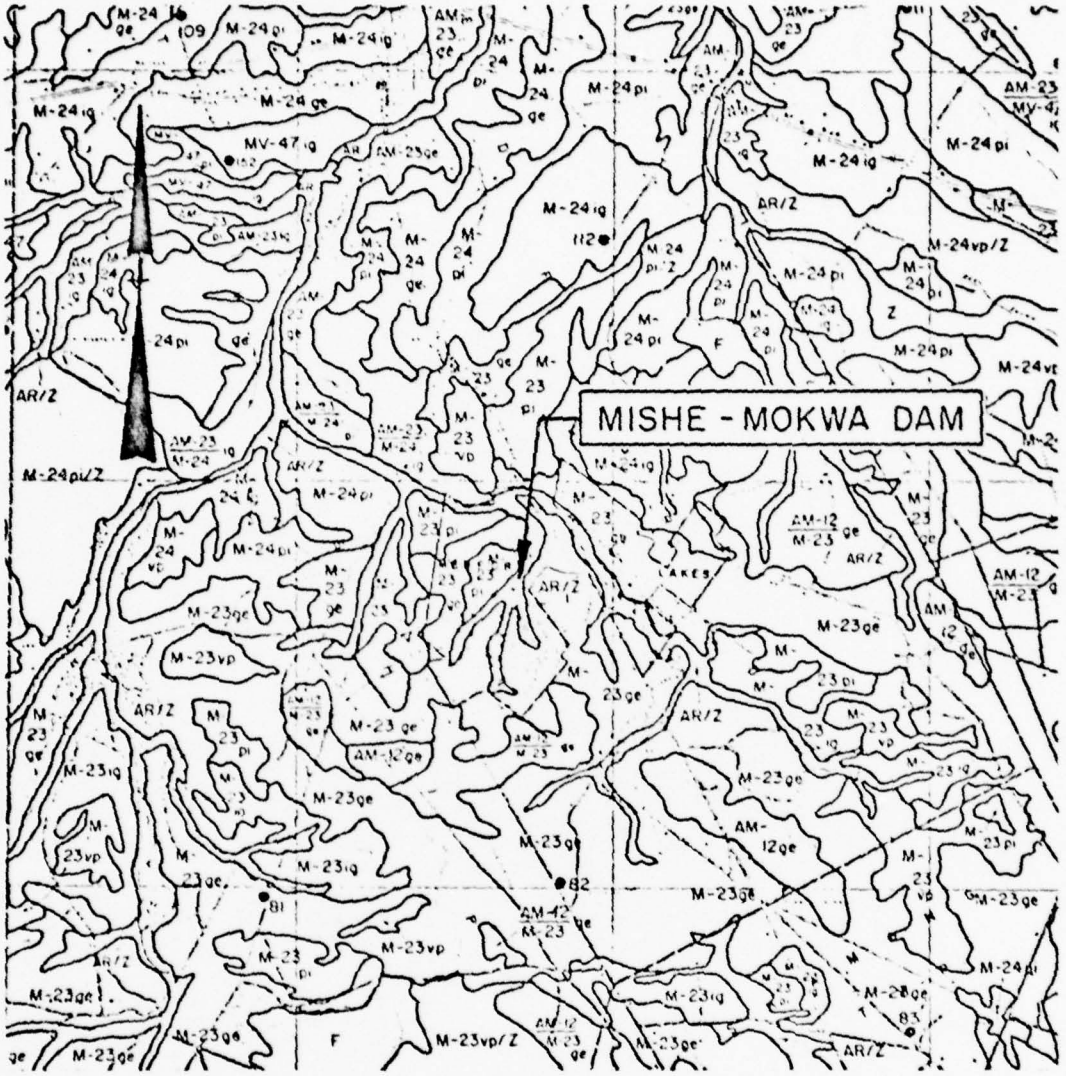
DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

VICINITY MAP

MISHE - MOKWA DAM

I.D.N.J. 00419	SCALE: AS SHOWN
	DATE: FEBRUARY, 1979



Legend

AR/Z Stratified, swampy alluvium

M-23 Stratified materials, predominantly silty sand and narrowly graded sand, deposited during the Tertiary period. (Kirkwood Sand formations.)

Note: Information taken from Rutgers University Soil Survey of New Jersey, Report No. 20 and Geologic Map of New Jersey prepared by Lewis and Kummel.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

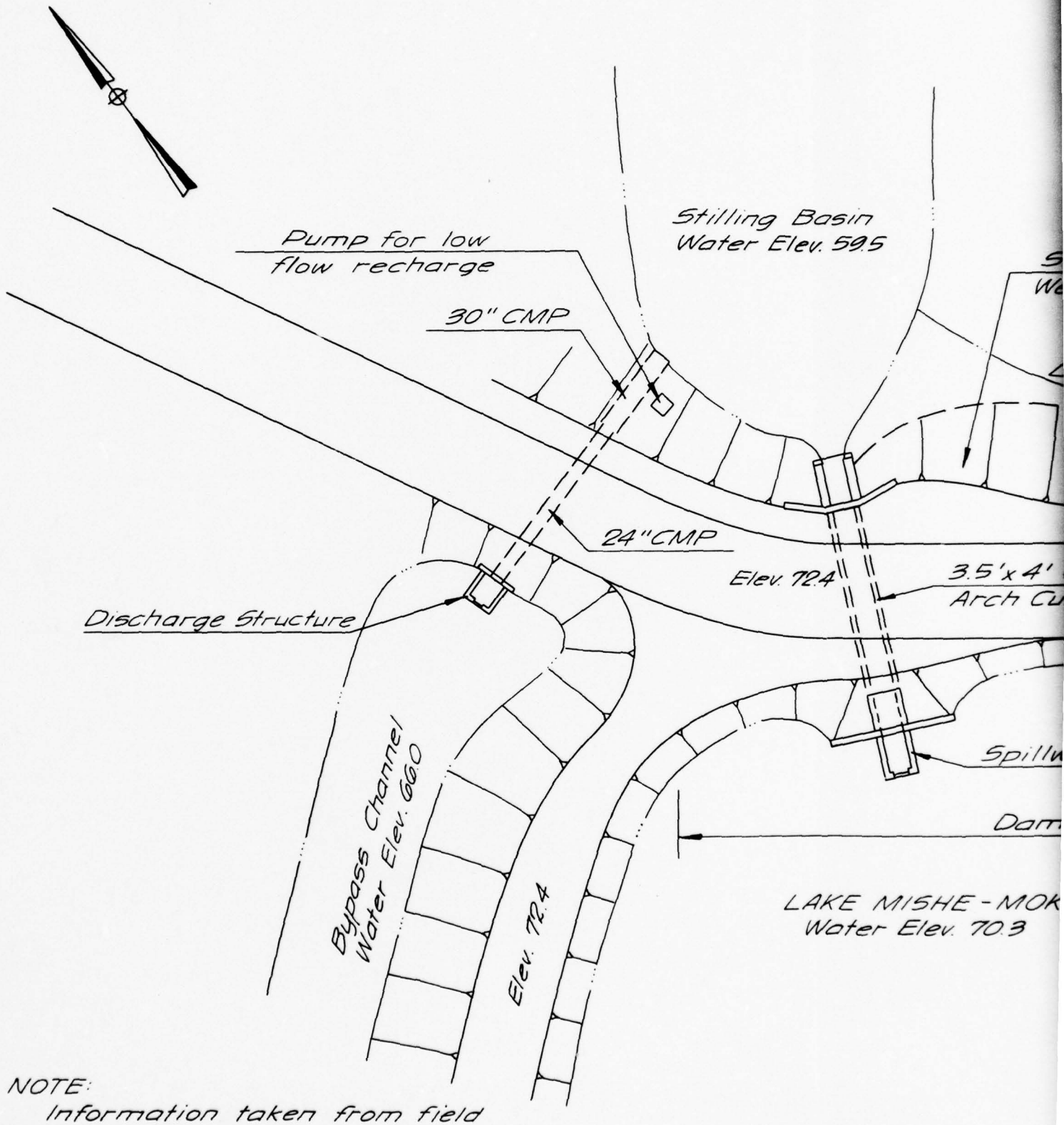
SOIL MAP

MISHE - MOKWA DAM

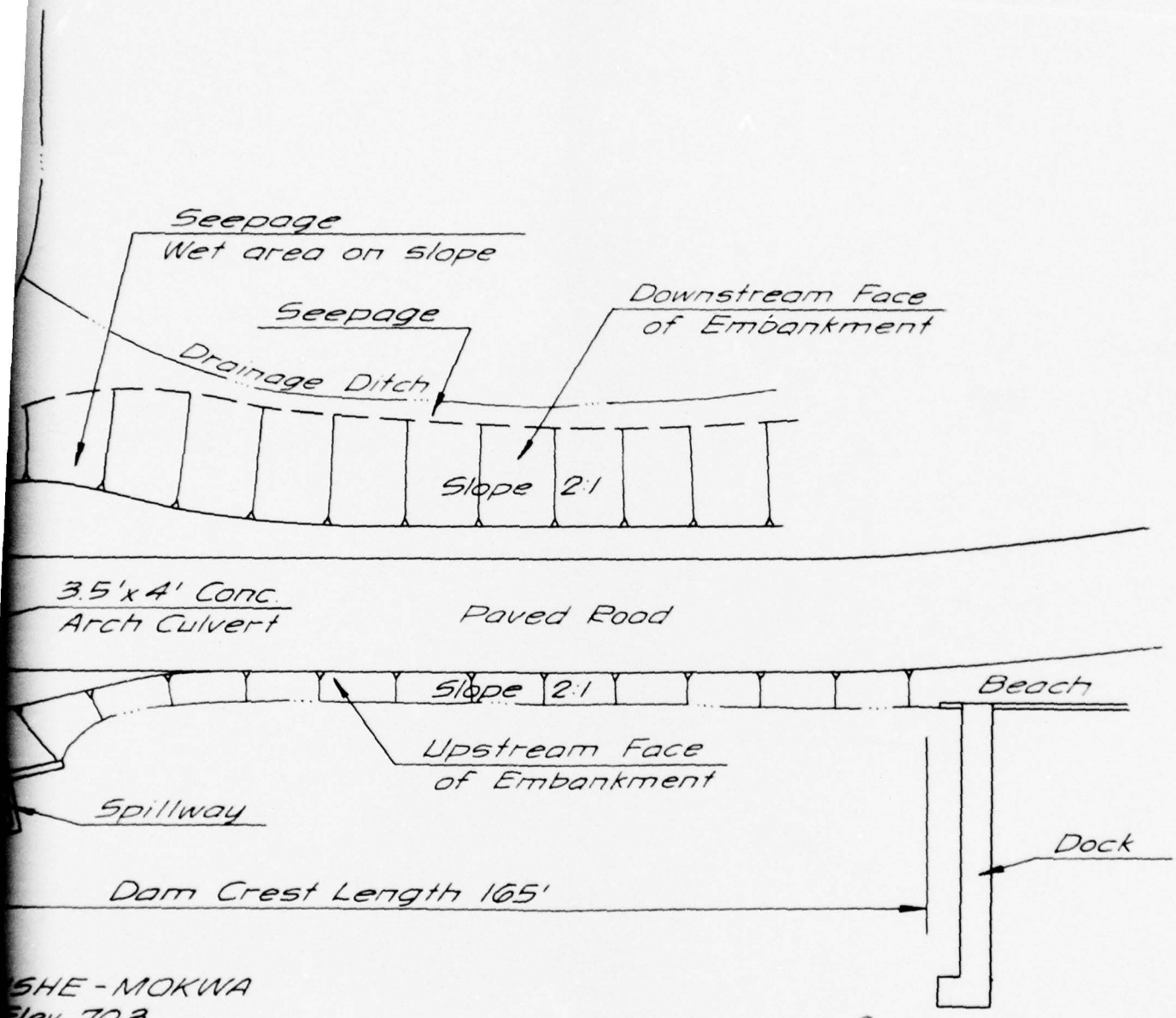
I.D. N.J. 00419

SCALE: NONE

DATE: FEBRUARY, 1979



NOTE:
Information taken from field inspection December 12, 1978.



2

PLATE 4

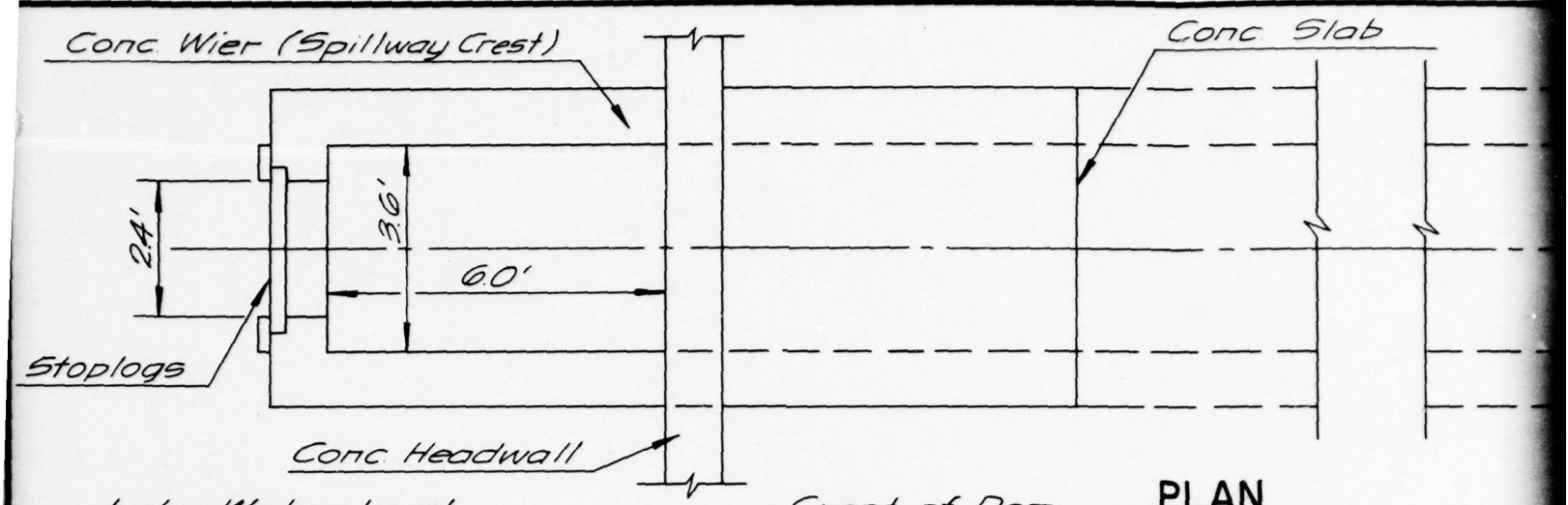
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

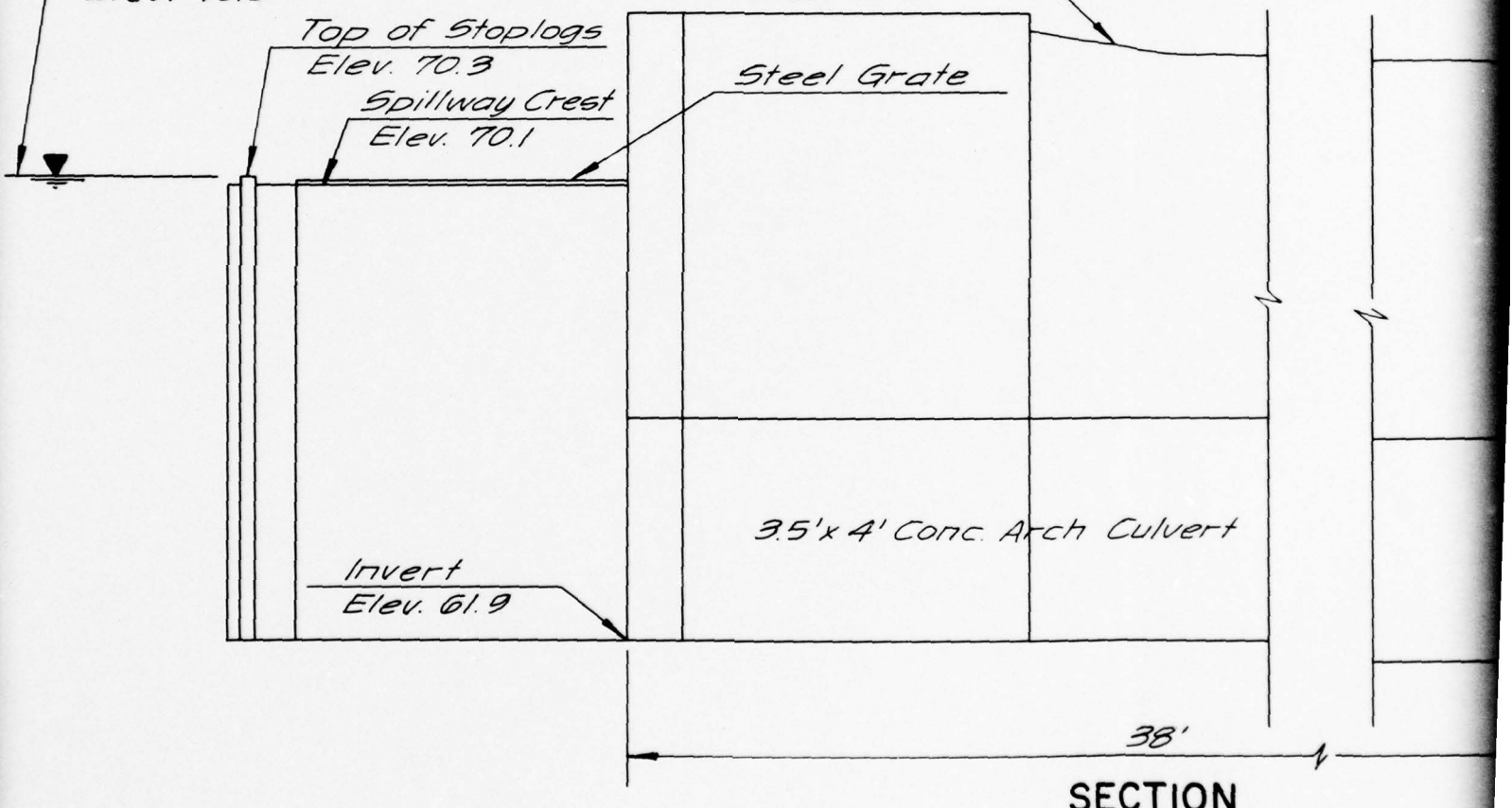
GENERAL PLAN

MISHE - MOKWA DAM

I.D.N.J. 00419	SCALE: NOT TO SCALE
	DATE: FEBRUARY, 1979



PLAN



SECTION

NOTE:
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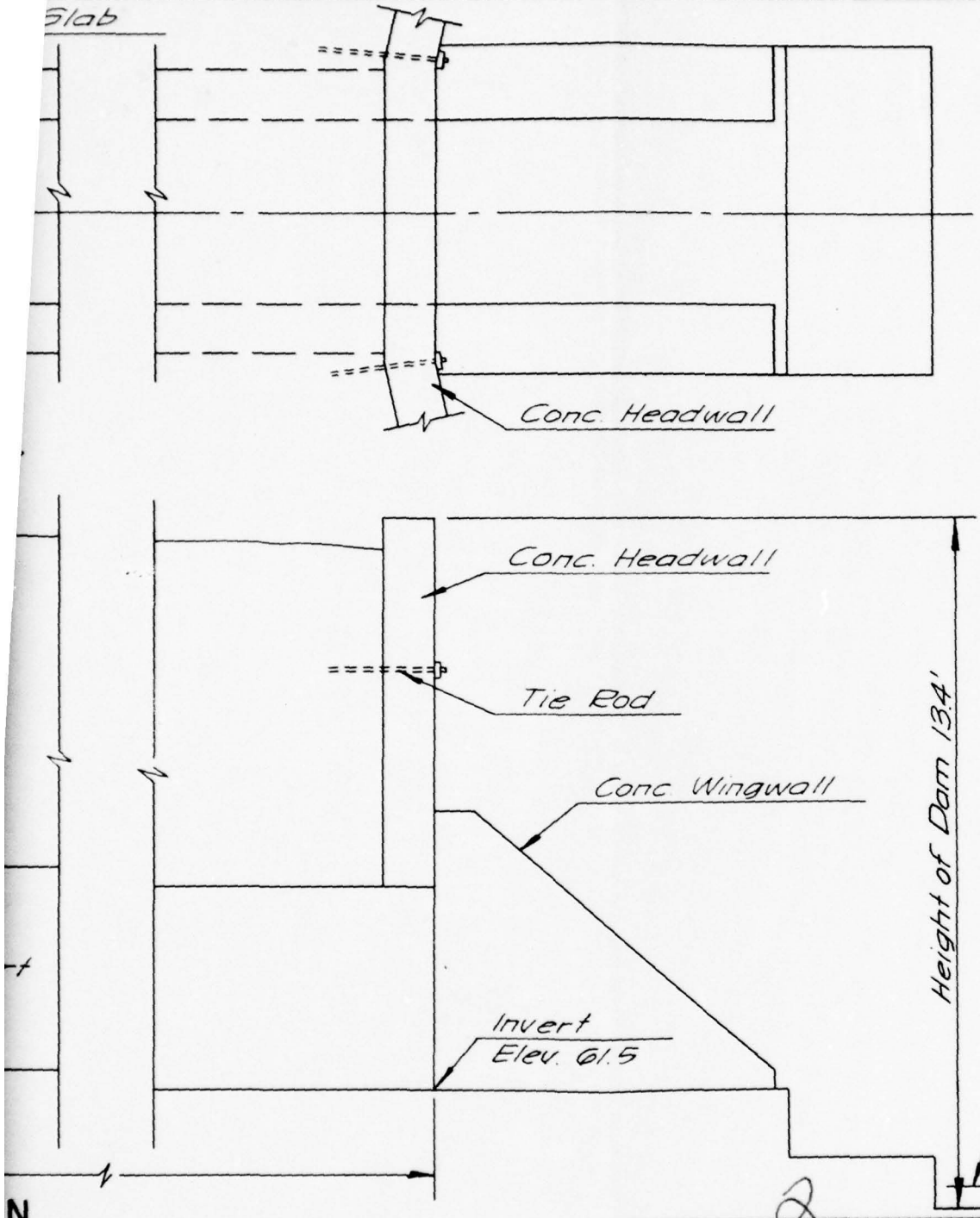


PLATE 5

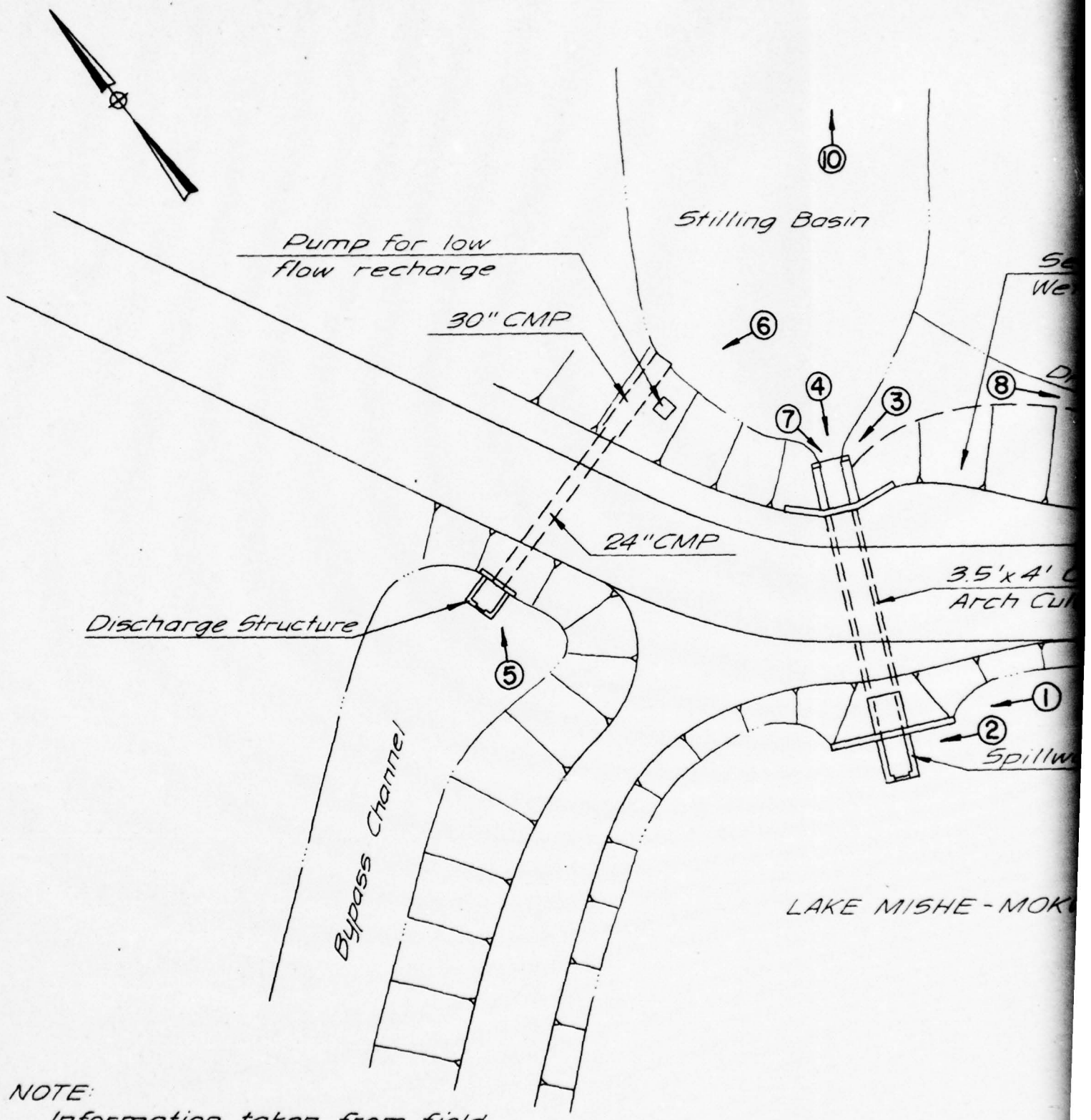
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

SPILLWAY PLAN & SECTION

MISHE - MOKWA DAM

I.D.N.J. 00419	SCALE: NOT TO SCALE
	DATE: FEBRUARY, 1979



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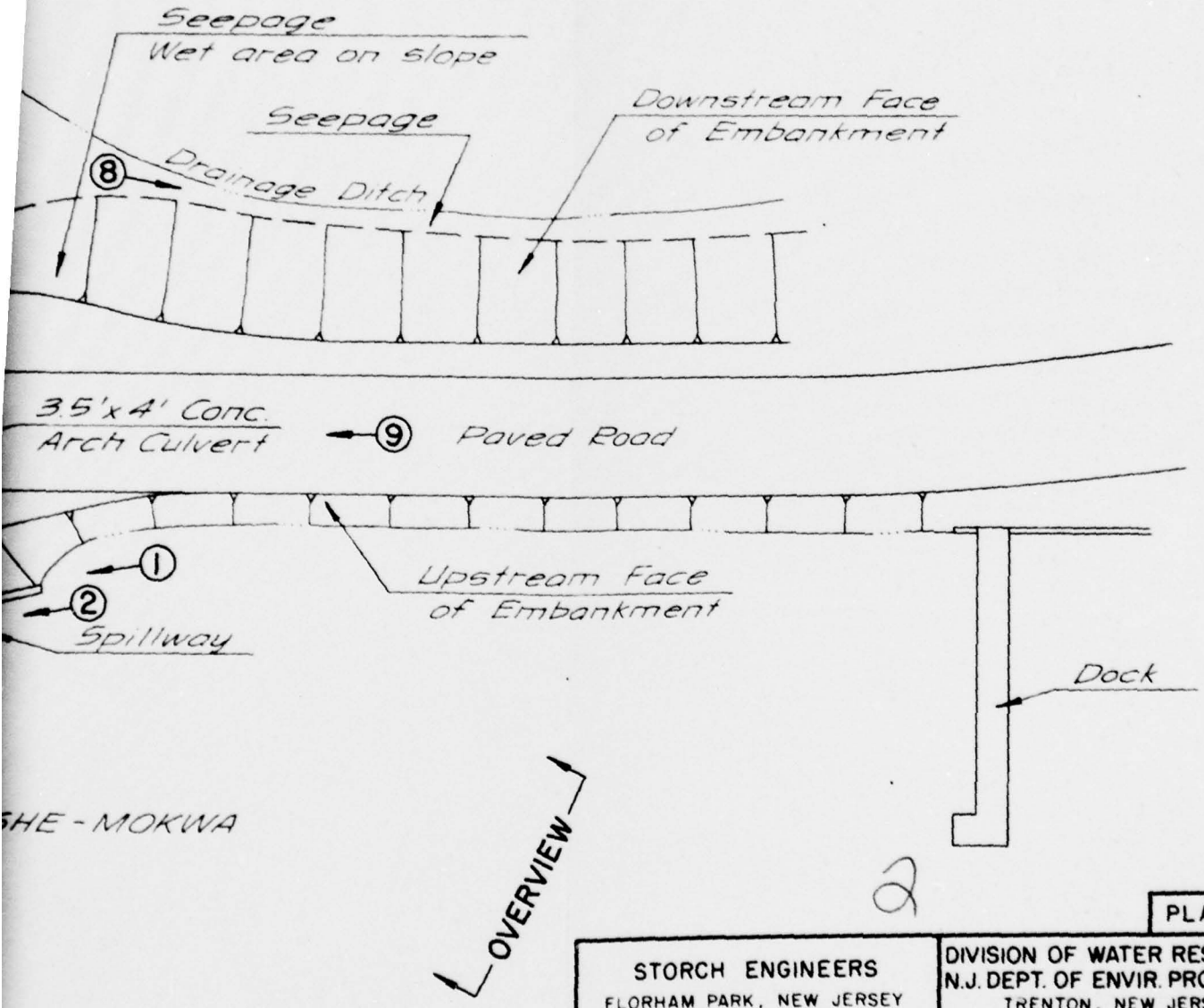

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PLATE 6

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

PHOTO LOCATION PLAN

MISHE - MOKWA DAM

I.D.N.J. 00419	SCALE: NOT TO SCALE
	DATE: FEBRUARY, 1979

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List
Visual Inspection
Phase 1

Name Dam Mishe-Mokwa County Burlington State N.J. Coordinators NJDEP

Date(s) Inspection 12/12/78 Weather Partly Cloudy Temperature 42°F

Pool Elevation at Time of Inspection 70.3 M.S.L. Tailwater at Time of Inspection 59.5 M.S.L.

Inspection Personnel:

R. McDermott

John Gribbin

Dinesh Patel

J.Gribbin Recorder

Present: Carl Goodfellow, Medford Lakes Borough maintenance staff.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE	N.A.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N.A.	
DRAINS	N.A.	
WATER PASSAGES	N.A.	
FOUNDATION	N.A.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N.A.	
STRUCTURAL CRACKING	N.A.	
VERTICAL AND HORIZONTAL ALIGNMENT	N.A.	
MONOLITH JOINTS	N.A.	
CONSTRUCTION JOINTS	N.A.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Some erosion noted, especially on downstream face.	Leaning of fence posts along road on dam crest is not due to movement in the embankment.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Horiz. - slightly curved Vert. - level	Section of the lake shore southeast of dam approx. 1 foot lower than dam crest. Section is in a beach area and is approx. 200' long.
RIPRAP FAILURES	None observed	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Embankment is sandy with some grass on upstream face and grass, brush and trees on downstream face.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Slight erosion at spillway.	
ANY NOTICEABLE SEEPAGE	Seepage observed at downstream toe of embankment, approx. 60' east of spillway. Seepage is slight and flows into a drainage ditch running parallel to toe of embankment.	
STAFF GAGE AND RECORDER	None	
DRAINS	N.A.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Concrete deteriorated at outlet end of arch culvert. (See Photo 7).	Outlet conduit (conc. arch culvert) serves for outlet works and spillway.
INTAKE STRUCTURE	Stoplogs in slot in upstream end of spillway Condition appeared to be satisfactory.	Stoplogs in spillway drop inlet serve as controlled weir portion of spillway and as outlet works.
OUTLET STRUCTURE	Same as outlet conduit.	
OUTLET CHANNEL	N.A.	
EMERGENCY GATE	Same as intake structure.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N.A.	
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	N.A.	
BRIDGE AND PIERS	N.A.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Weir formed by sides of drop inlet in good condition.	Spillway consists of uncontrolled conc. weir and controlled timber stop logs. (See OUTLET WORKS)
APPROACH CHANNEL	N.A.	
DISCHARGE CHANNEL	Discharge from spillway outflows through dam via concrete arch culvert.	
BRIDGE AND PIERS	N.A.	
GATES AND OPERATION EQUIPMENT	Timber stoplogs. (See OUTLET WORKS).	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Bench mark on east end of spillway wall.	Elev. = 73.24
OBSERVATION WELLS	NONE	
WEIRS	NONE	
PIEZOMETERS	NONE	
OTHER	N.A.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes range from less than 1% to 20% and average approx. 4%.	Dam crest is 2 feet higher than normal lake elevation. However, road adjacent to beach approx. 100 feet east of dam is 1 foot higher than normal lake elevation forming an overflow area.
SEDIMENTATION	Not Known	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Downstream channel is a narrow lake, wooded on both banks. No significant obstructions. (Name of lake: Ballinger Lake.)	Residential development along both banks.
SLOPES	Side slopes of downstream channel are moderately steep (10% to 20%).	
APPROXIMATE NO. OF HOMES AND POPULATION	Approx. 25 homes within 1600'. Height of homes above normal water level ranges from 2' to 10'.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Not Avaialable
REGIONAL VICINITY MAP	Available
CONSTRUCTION HISTORY	Not Available
TYPICAL SECTIONS OF DAM	Not Available
HYDROLOGIC/HYDRAULIC DATA	Not Available
OUTLETS - PLAN	Not Available
- DETAILS	Not Available
-CONSTRAINTS	Not Available
-DISCHARGE RATINGS	Not Available
RAINFALL/RESERVOIR RECORDS	Not Available

ITEM	REMARKS
DESIGN REPORTS	Not Available
GEOLOGY REPORTS	Not Available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not Available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not Available
POST-CONSTRUCTION SURVEYS OF DAM	Not Available
BORROW SOURCES	Not Available

ITEM	REMARKS
MONITORING SYSTEMS	Not Available
MODIFICATIONS	Not Available
HIGH POOL RECORDS	Not Available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not Available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not Available
MAINTENANCE OPERATION RECORDS	Not Available

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	Not Available
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Not Available

APPENDIX 2

Photographs

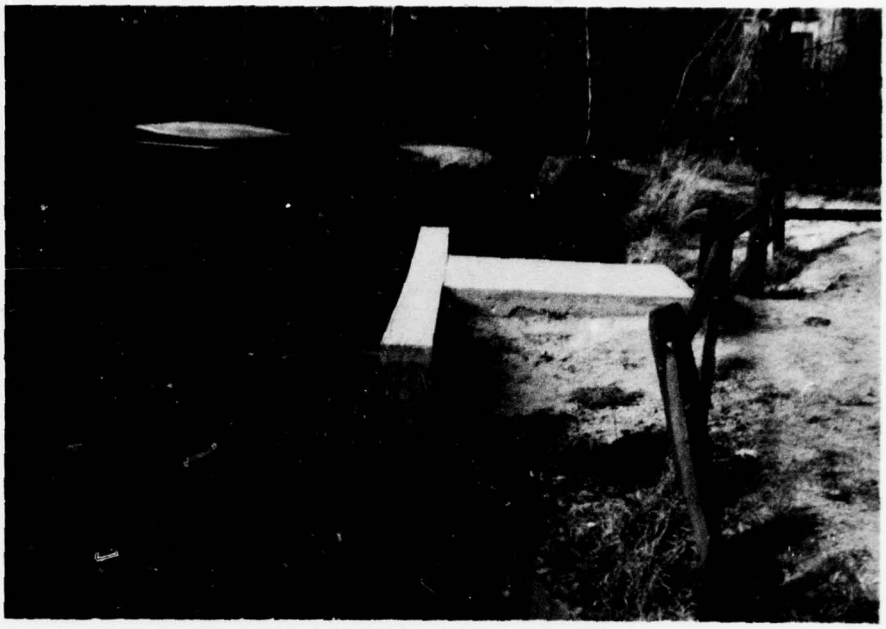


PHOTO 1

SPILLWAY

PHOTO 2

SPILLWAY GRATE AND STOPLOGS

12 DEC. 1978

PHOTO 3

SPILLWAY DISCHARGE CULVERT OUTLET.
DOWNSTREAM FACE OF EMBANKMENT.

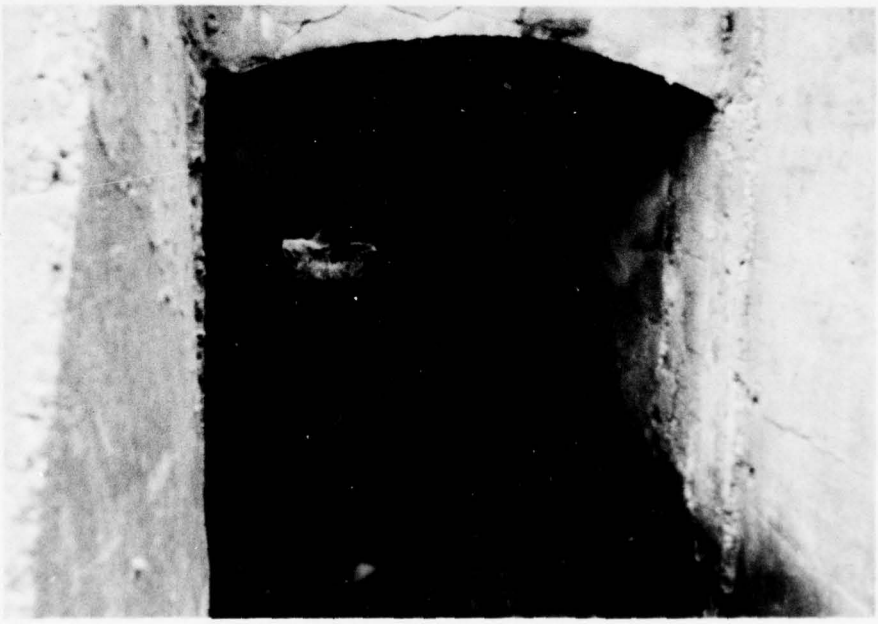


PHOTO 4

SPILLWAY DISCHARGE CULVERT.

12 DEC. 1978

PHOTO 5

DISCHARGE STRUCTURE FOR BYPASS CHANNEL.

PHOTO 6

OUTLET FOR BYPASS CHANNEL.
PUMP FOR LOW FLOW RECHARGING.

12 DEC. 1978

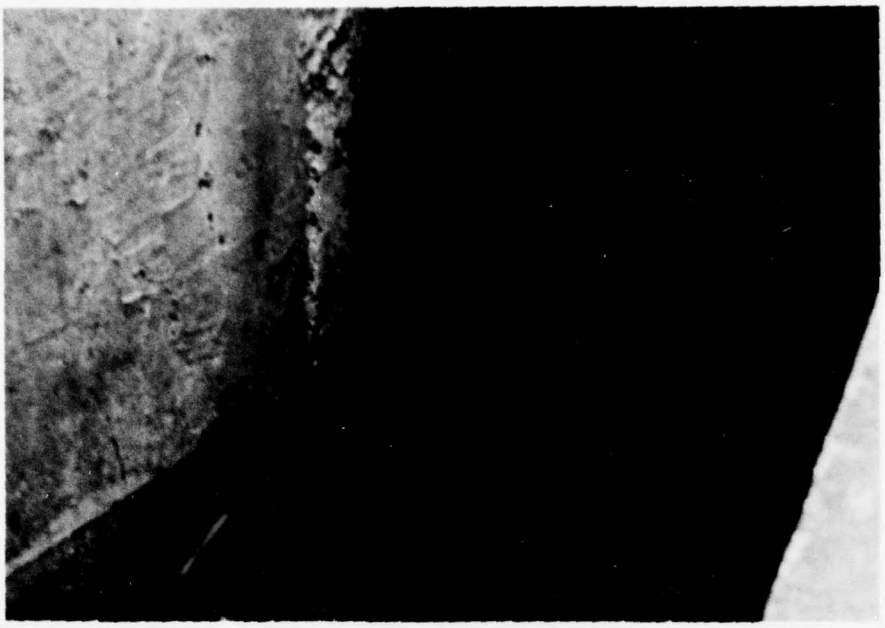


PHOTO 7

CONCRETE DETERIORATION IN SPILLWAY DISCHARGE CULVERT.

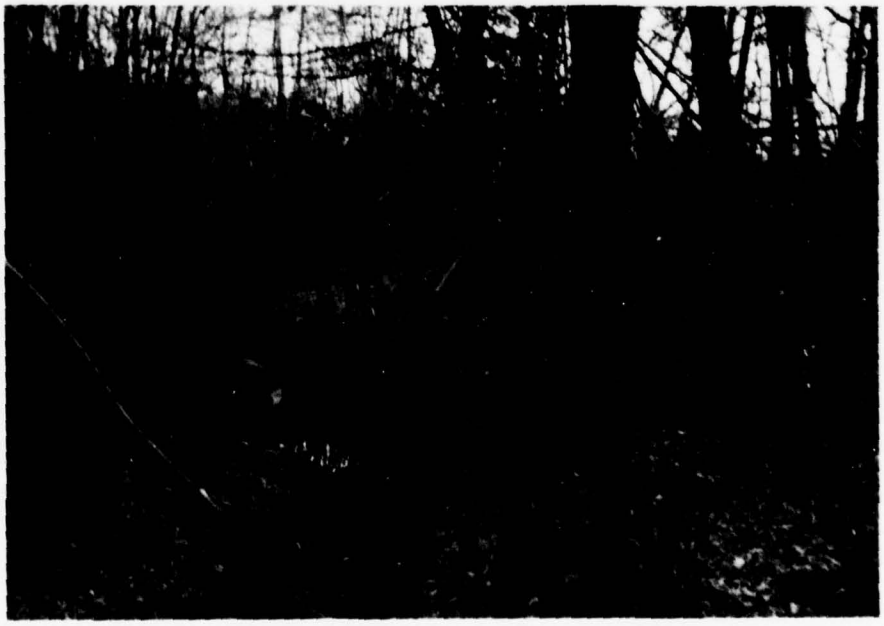


PHOTO 8

DRAINAGE DITCH WITH SEEPAGE FLOW.

12 DEC. 1978

PHOTO 9

ROAD ON CREST OF DAM.

PHOTO 10

DOWNSTREAM CHANNEL.

12 DEC. 1978

APPENDIX 3

Engineering Data

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Residential and wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 70.3 (192 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 72.9

ELEVATION TOP DAM: 72.4 (Field measured)

SPILLWAY CREST: Concrete weir & timber stoplogs

- **a. Elevation** 70.1
- **b. Type** uncontrolled overflow
- **c. Width** 12 inches
- **d. Length** Total 15.6 feet
- **e. Location Spillover** Box inlet at upstream side of dam
- **f. Number and Type of Gates** One gate - timber stoplogs 2.4 feet long

OUTLET WORKS: 2.4 foot long slot in spillway

- **a. Type** Gate
- **b. Location** Upstream end of spillway
- **c. Entrance inverts** 61.9
- **d. Exit inverts** 61.5
- **e. Emergency draindown facilities:** Remove stoplogs

HYDROMETEOROLOGICAL GAGES: None

- **a. Type** N.A.
- **b. Location** N.A.
- **c. Records** N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake stage equal to elev. 71.2) 42 c.f.s.

APPENDIX 4

Hydrologic Computations

STORCH ENGINEERS

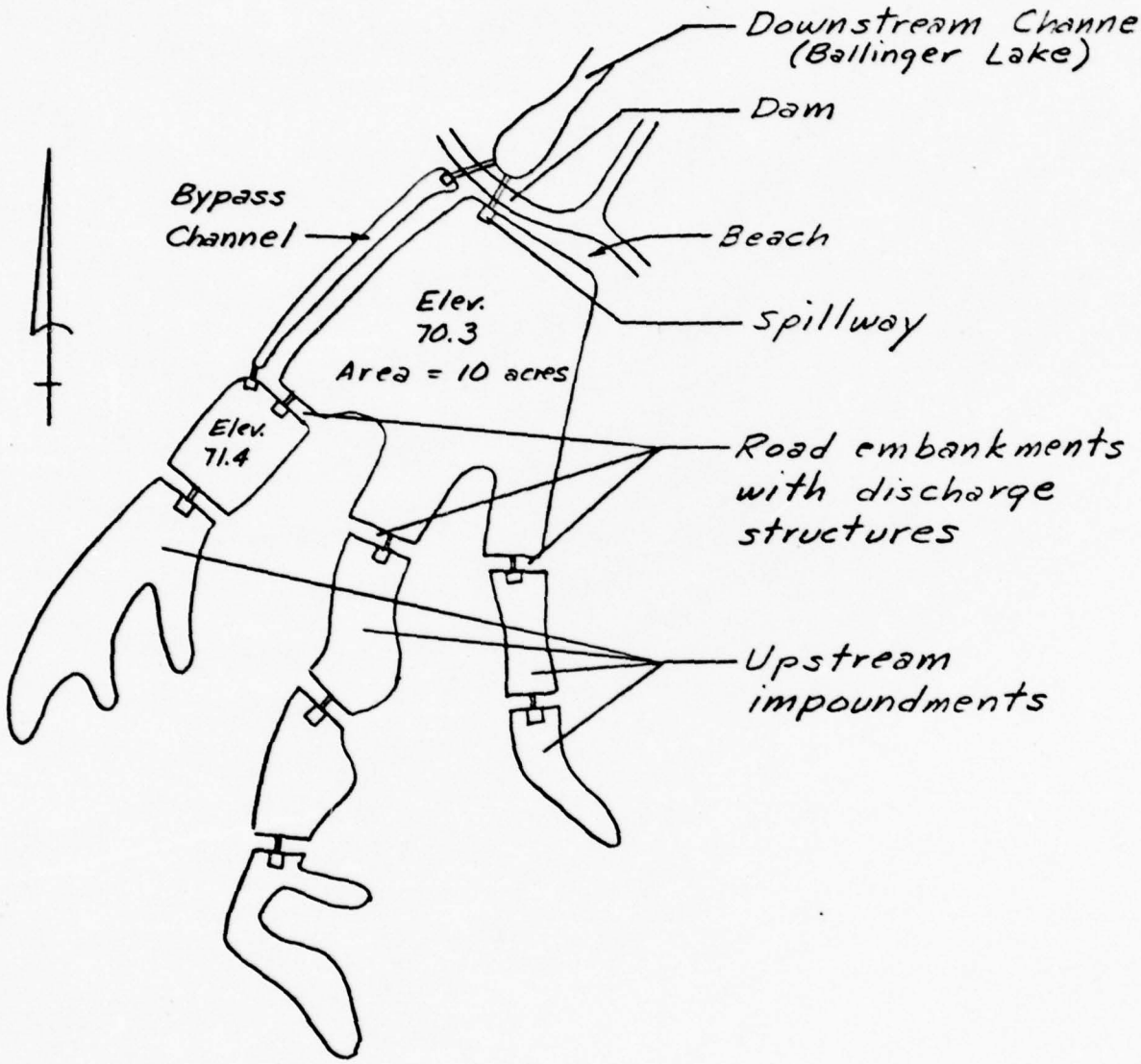
Sheet 1 of _____

Project 1132

Made By JG Date 5/2/79

Mishe-Mokwa Dam

Chkd By _____ Date _____



The impoundment of Mishe-Mokwa Dam consists of one main lake (elev. 70.3) and 7 upstream impoundments seperated by road embankments and connected by discharge structures. Runoff from any storm is naturally routed through the upstream impoundments before reaching the dam. However, for simplicity, all 8 bodies of water will be considered to act as one lake.

STORCH ENGINEERS

Sheet 2 of ____

Project 1132 Made By KL Date 3-5-79

Mishe - Ha-Kwa Dam Chkd By JG Date 3/6/79

Size Classification

Surface area of main impoundment	10 Ac ±
Average depth of lake	4 ft.
Structural height of dam	12.9 ft.
Size classification	Small

Hazard Potential Classification

Number of inhabitable structures	approx. 25
Hazard potential classification	high
Recommended SDF	½ PMF

Hydrologic Analysis

The HEC-1-DB will be used to route the flood using SCS triangular unit hydrograph with curvilinear transformation.

Drainage area = 0.83 sq. mi.

STORCH ENGINEERS

Sheet 3 of

Project 1132 Made By KL Date 2-5-79

Hlisha Mokwa Dam Chkd By JG Date 3/6/79

Precipitation

(Re "Design of Small Dams" USDI, 1973)

From fig 15, Zone 6.

Probable Maximum Precipitation = 27 inches for 6 hr. duration and 10 sq. mi - area.

Duration (hrs)	% PMP
6	100
12	109
24	117

Infiltration Data

Hydrologic soil group A

Land use ½ urban ½ woodlots

USE initial infiltration 1.5 inch

Constant infiltration 0.15 inch/hr.

STORCH ENGINEERS

Sheet 4 of ____

Project 1132 Made By RL Date 4-2-79

Hiishe Hoking Dam Chkd By ____ Date ____

Time of concentration

Overland 1500' @ 1.5%
Vel 0.35 fps
T 1.2 hrs (Ref. SCS TR-55)

Channel 1800' @ 1.1%
Vel 1.6 fps
T 0.3 hrs

Tc = 1.2 + 0.3 = 1.5 hrs

Alternate method

Nomograph Pg 71 "Design of Small Dam"

L = 0.625 mi
H = 42'

Tc = 0.39 hr x 2.2 (adjustment factor)
= 0.86 hrs

use Tc = 1.2 hr

Lag = 0.6 Tc
= 0.6 x 1.2

Lag = 0.72 hrs.

Lake Storage Volume

Information from USGS & Aerial photos

EL. (Ft)	62.0*	70.3	71.3	72.4
Surface area (Ac)	0	48.0	57.6	70.5

*

Bottom of lake at spillway

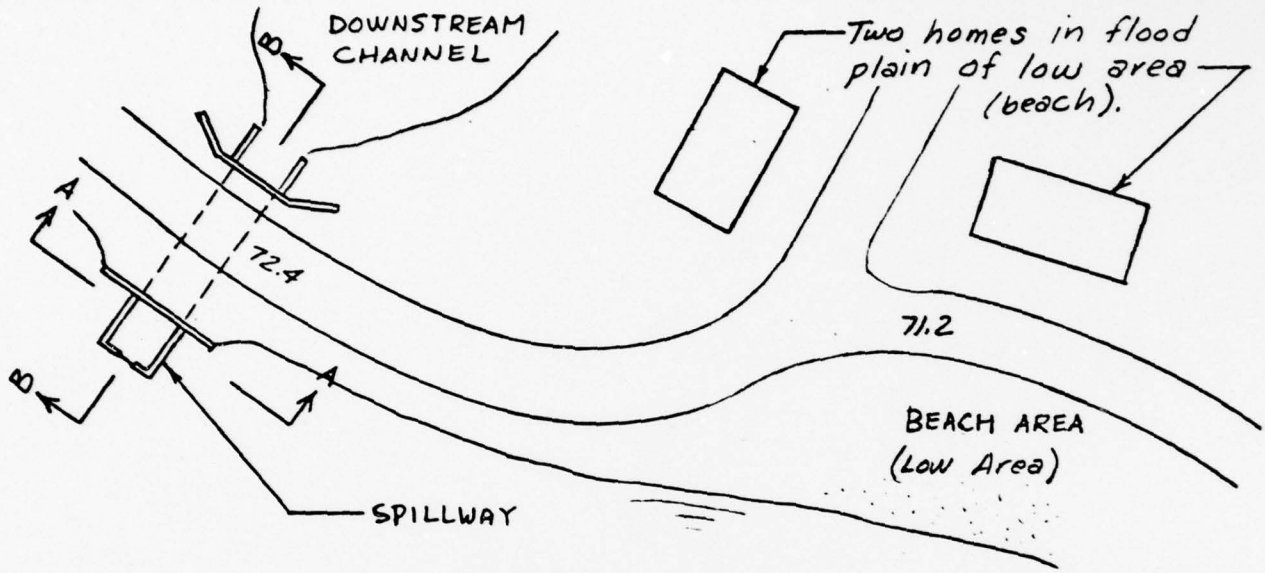
HEC-1-DB program will develope storage capacity from surface area & elev.

STORCH ENGINEERS

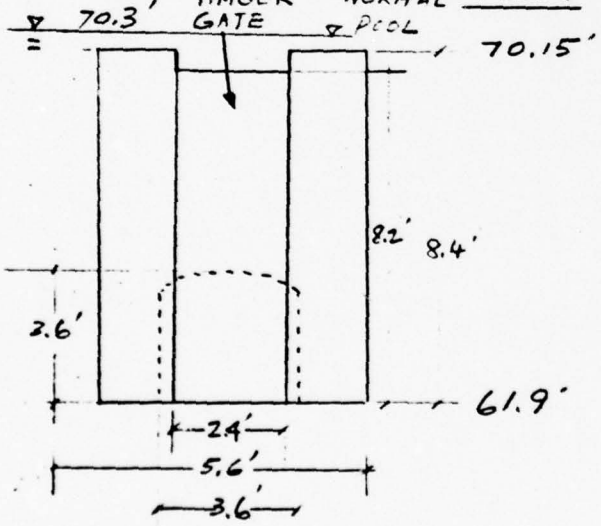
Sheet 6 of

Project 1132 Made By RL Date 3-5-79

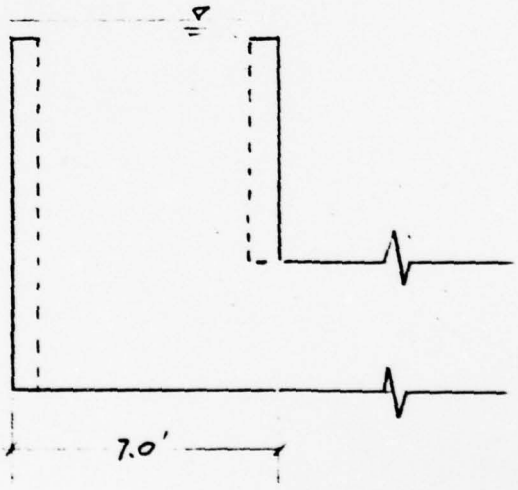
Nishe - Hokua Dam Chkd By JG Date 3-6-79



PLAN



SECTION A-A



SECTION B-B

STORCH ENGINEERS

Sheet 7 of ____

Project 1132 Made By RL Date 3-5-79

Hiehe Hakwa Dam Chkd By JG Date 3-6-79

Elevation - Discharge Tabulation

L_1 = 2.4' effective length of stage 1 sharp crest weir
L_2 = 13.2' effective length of stage 2 broad crest weir
L_3 = 200' length of beach area

C_1 C_2 C_3 coef. of discharge for L_1 L_2 L_3 respectively.
C_1 = 3.3
C_2 = 2.7 to 3.3
C_3 = 2.6

Q_1 Q_2 Q_3 discharge over L_1 L_2 L_3 respectively.

Q_{pipe} discharge thru 3.5' x 3.5' culvert

Controlling Q_c will be the smaller value of Q_{pipe} vs Q_1+Q_2

STAGE DISCHARGE TABULATION

W.L. (ft)	h_1 (ft)	Q_1 (cfs)	h_2 (ft)	C_2	Q_2 (cfs)	Q_1+Q_2 (cfs)	Q_{pipe}* (cfs)	Q_c (cfs)	h_3 (ft)	Q_3 (cfs)	$\Sigma Q = Q_3+Q_c$ (cfs)
70.1	0	0	-	-	0	0	-	0	-	0	0
70.2	0.1	0.3	-	-	0	0.3	-	0.3	-	0	0.3
70.4	0.3	1.3	0.1	2.7	1.1	2.4	-	2.4	-	0	2.4
70.6	0.5	2.8	0.3	2.7	5.9	9	-	9	-	0	9
70.8	0.7	4.6	0.5	2.7	13	18	-	18	-	0	18
71.0	0.9	6.6	0.7	2.8	22	29	150	29	-	0	29
71.2	1.1	9.1	0.9	2.9	33	42	-	42	0	0	42
71.4	1.3	12	1.1	3.0	46	58	-	58	0.2	47	105
71.6	1.5	15	1.3	3.1	61	76	-	76	0.4	132	208
71.8	1.7	18	1.5	3.2	78	96	169	96	0.6	242	338
72.0	1.9	21	1.7	3.3	97	118	-	118	0.8	372	490
72.2	2.1	24	1.9	3.3	114	138	-	138	1.0	520	658
72.4	2.3	27	2.1	3.3	133	160	182	160	1.2	684	844
72.6	2.5	31	2.3	3.3	310	371	196	196	2.8	2436	2632

* From Bur. Reclamation Culvert Charts.

STORCH ENGINEERS

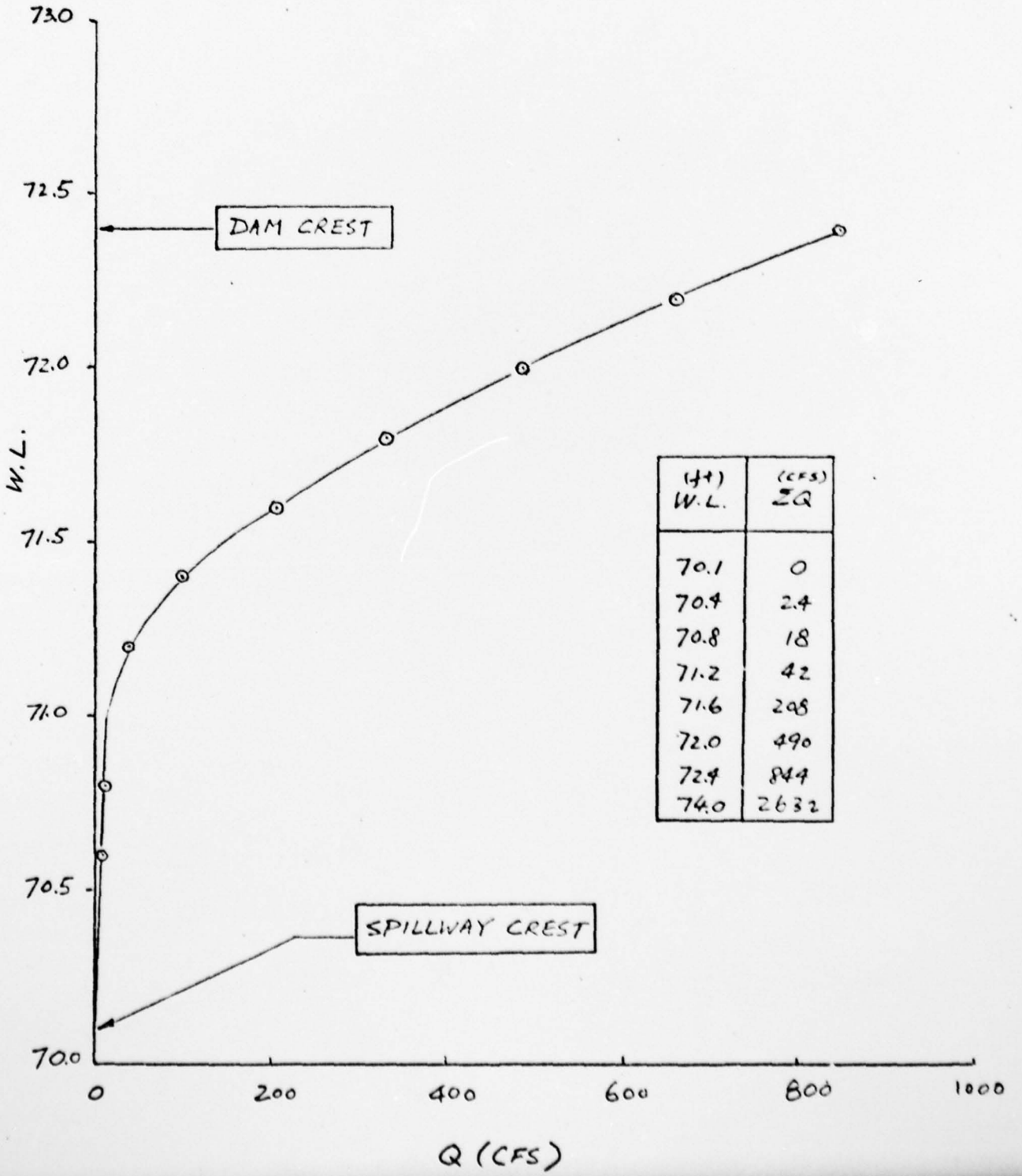
Sheet 8 of _____

Project 1132 Misha Mokwa Dam

Made By RL Date 3-5-79

Chkd By JG Date 3-6-79

STAGE DISCHARGE CURVE



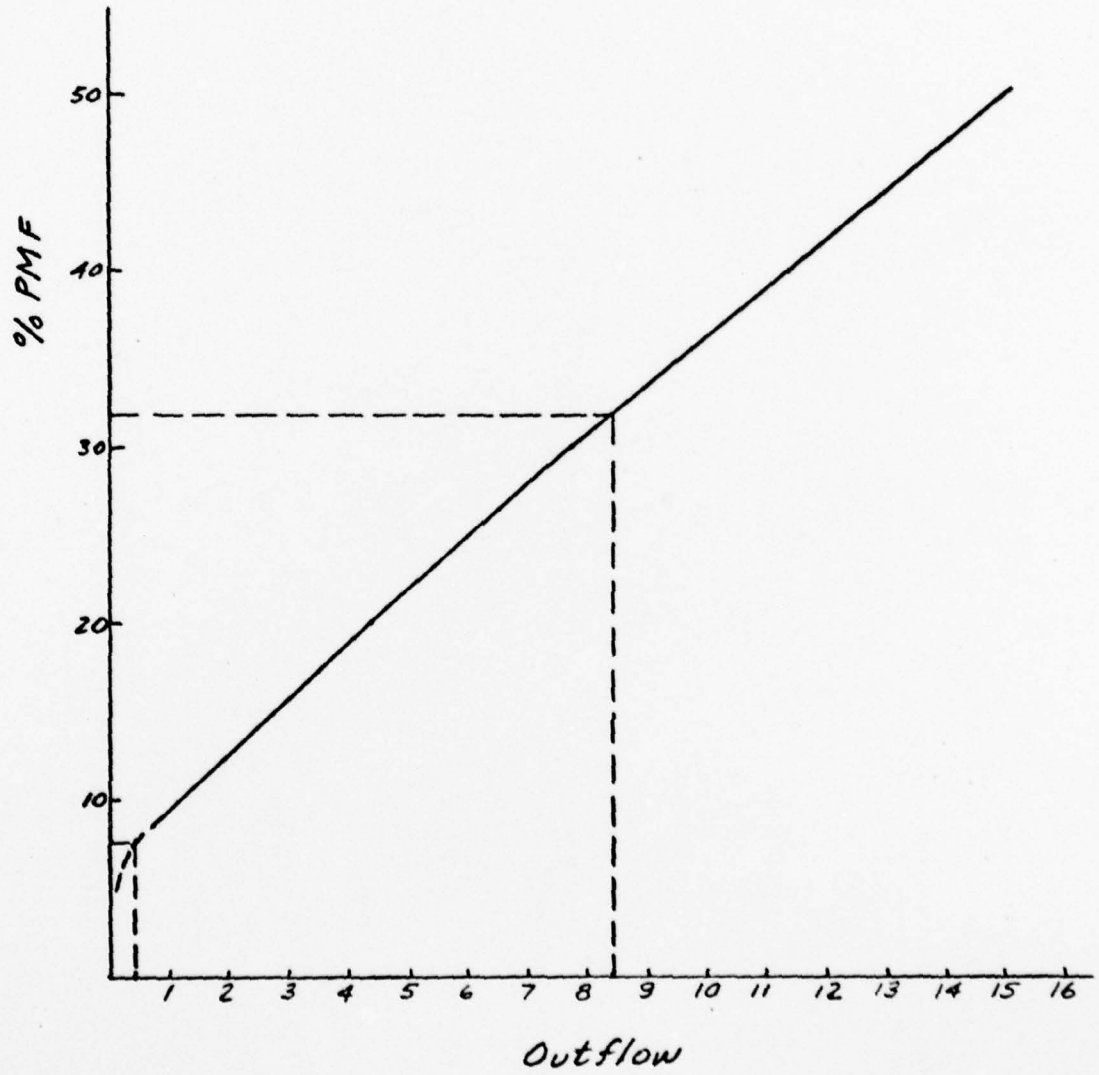
(ft) W.L.	(CFS) ΣQ
70.1	0
70.4	2.4
70.8	18
71.2	42
71.6	208
72.0	490
72.4	844
74.0	2632

STORCH ENGINEERS Sheet 9 of _____

Project 1132 Made By JG Date 4-2-79

Mishe-Mokwa Dam Chkd By _____ Date _____

OVERTOPPING POTENTIAL



Overtopping of low area occurs at elev. 71.2 with Q = 42 cfs. (~ 8 % PMF)
Overtopping of dam occurs at elev. 72.4 with Q = 844 c.f.s. (~ 32 % PMF)

STORCH ENGINEERS

Sheet _____ of _____

Project 1132

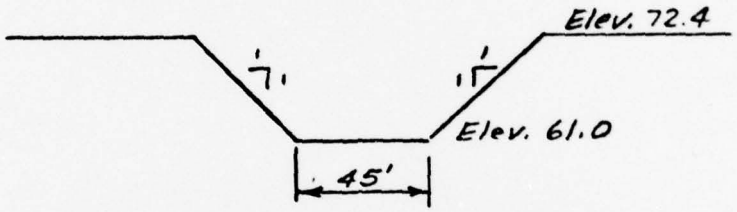
Made By JG Date 4-4-79

Mishe-Mokwa Dam

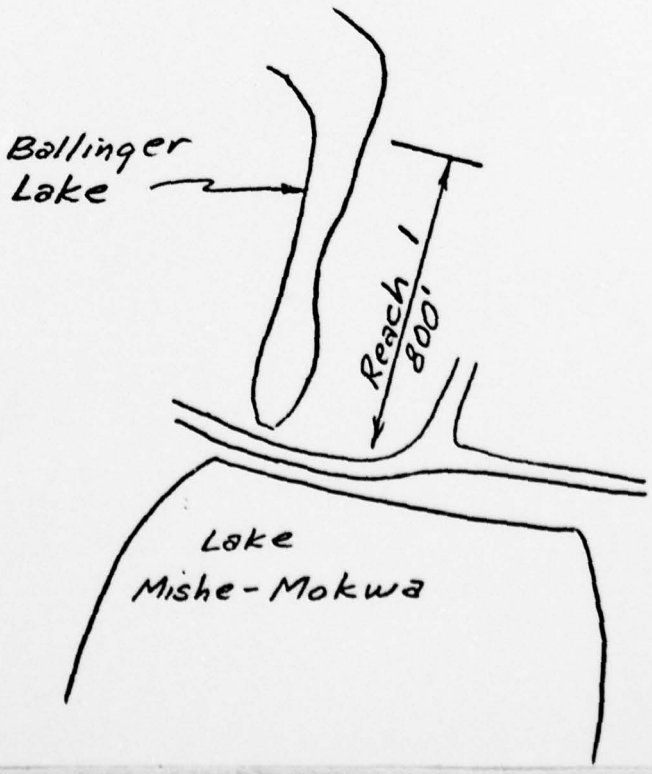
Chkd By _____ Date _____

BREACH ANALYSIS

Assume breach begins to develop when reservoir stage reaches elev. 72.4 (top of dam).
Time to fully develop = 1.0 hr.



FULLY DEVELOPED BREACH



STORCH ENGINEERS

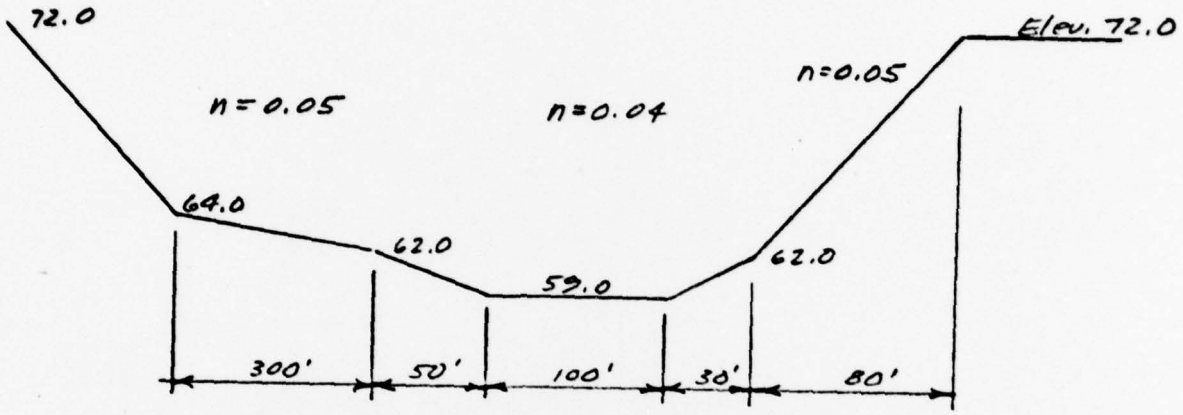
Sheet _____ of _____

Project 1132

Made By JG Date 4-4-79

Mishe - Makwa Dam

Chkd By _____ Date _____



CROSS SECTION
END OF REACH 1

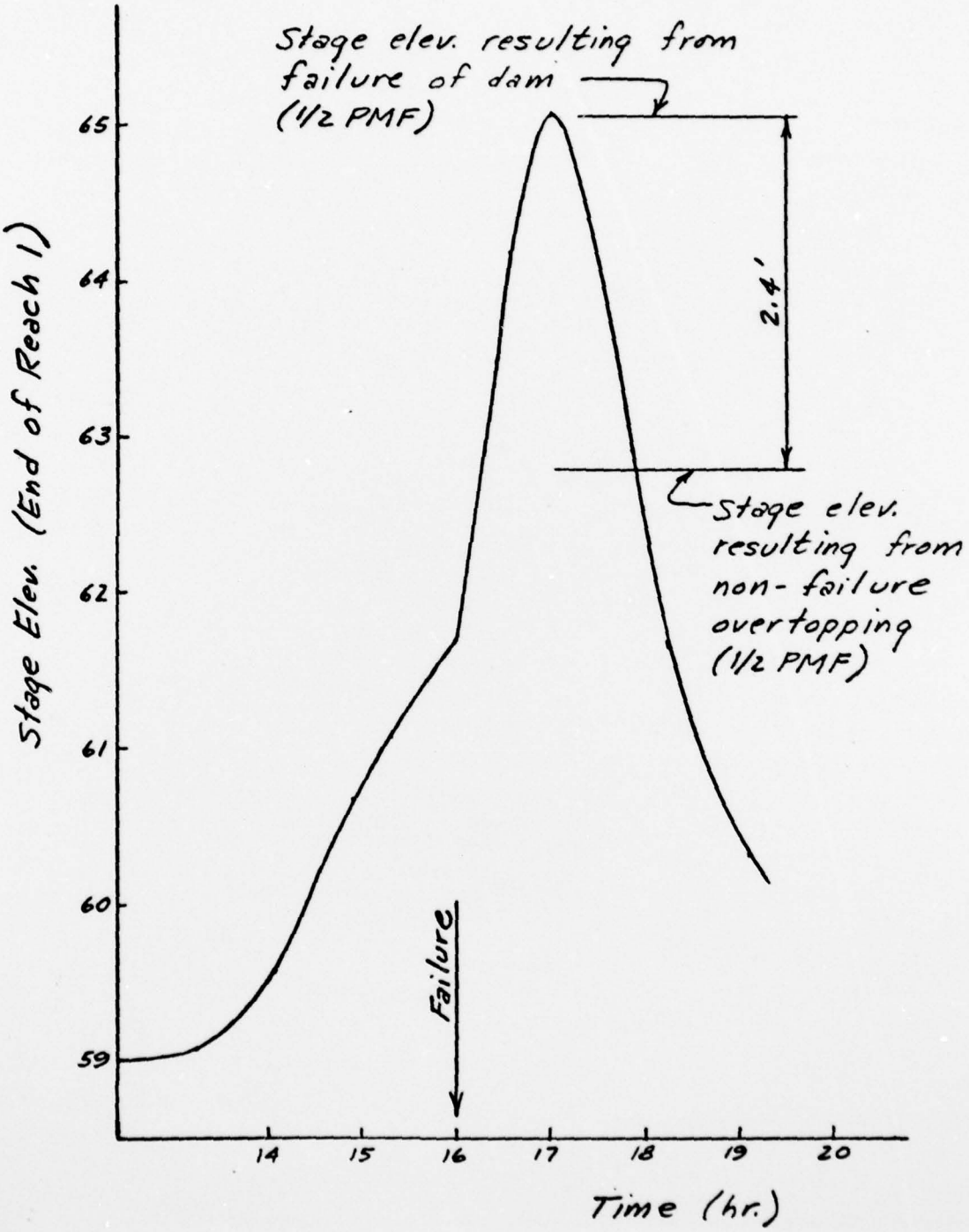
S=0.001

STORCH ENGINEERS

Sheet _____ of _____

Project 1132 Made By JG Date 4-4-79

Mishe-Mokwa Dam Chkd By _____ Date _____



HEC-1-DB COMPUTATIONS

```
A1                                NATIONAL DAM SAFETY PROGRAM
A2                        MISHE MOKWA DAM          NEW JERSEY
A3                           MULTI RATIO PMF ROUTING
B     150          0          5                              0         0         3
B1      5
J       1          5          1
J1    0.5        0.4        0.3       0.2       0.1
K       0       LAKE                             0         0         1
K1                        INFLOW HYDROGRAPH TO MISHE MOKWA LAKE
M       1          2       0.83                0.83         0                   1
P       0       26.5        100       109       117
T                                                          1.5      0.15
J2                0.72
X    -1.0      -0.05        2.0
K       1        DAM                              0         0         1
K1                     ROUTE DISCHARGE THROUGH MISHE MOKWA LAKE DAM
Y                                        1         1
Y1      1                                                -70.1        -1
Y4   70.1       70.2       70.4      70.6      70.8      71.0      71.2      71.4      71.6      71.8
Y4   72.0       72.2       72.4      74.0
Y5      0        0.3        2.4       8.7        18        29        42       105       208       338
Y5    490        658        844      2632
$A      0       46.0       57.6      70.5
$E     62       70.1       71.3      72.4
$$   70.1
$D   72.4       2.63        1.5       165
K      99
A
A
A
A
A
```

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  11 JAN 79
**********************************

RUN  DATE= 79/04/02.
     TIME= 10.41.34.
```

NATIONAL DAM SAFETY PROGRAM
MISHE MOKWA DAM NEW JERSEY
MULTI RATIO PMF ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	5	0	0	0	0	0	3	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .50 .40 .30 .20 .10

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO MISHE MOKWA LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.83	0.00	.83	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	26.50	100.00	109.00	117.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .72

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 45 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .72 VOL= 1.00

19.	62.	118.	195.	294.	395.	470.	513.	525.	521.
486.	447.	399.	338.	273.	223.	186.	155.	132.	111.
94.	77.	65.	54.	46.	38.	32.	26.	22.	19.
15.	13.	11.	9.	8.	6.	5.	5.	4.	3.
3.	2.	2.	1.	0.					

PMF INFLOW HYDROGRAPH

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	12.05	145	.18	.16	.01	93.
1.01	12.10	146	.18	.16	.01	102.
1.01	12.15	147	.18	.16	.01	120.
1.01	12.20	148	.18	.16	.01	149.
1.01	12.25	149	.18	.16	.01	193.
1.01	12.30	150	.18	.16	.01	252.
0.00	0.00	151	.18	.16	.01	323.
0.00	0.00	152	.18	.16	.01	400.
0.00	0.00	153	.18	.16	.01	479.
0.00	0.00	154	.18	.16	.01	557.
0.00	0.00	155	.18	.16	.01	630.
0.00	0.00	156	.18	.16	.01	698.
0.00	0.00	157	.21	.20	.01	758.
0.00	0.00	158	.21	.20	.01	811.
0.00	0.00	159	.21	.20	.01	856.
0.00	0.00	160	.21	.20	.01	897.
0.00	0.00	161	.21	.20	.01	935.
0.00	0.00	162	.21	.20	.01	972.
0.00	0.00	163	.21	.20	.01	1009.
0.00	0.00	164	.21	.20	.01	1043.
0.00	0.00	165	.21	.20	.01	1076.
0.00	0.00	166	.21	.20	.01	1106.
0.00	0.00	167	.21	.20	.01	1133.
0.00	0.00	168	.21	.20	.01	1157.
0.00	0.00	169	.27	.25	.01	1179.
0.00	0.00	170	.27	.25	.01	1200.
0.00	0.00	171	.27	.25	.01	1220.
0.00	0.00	172	.27	.25	.01	1243.
0.00	0.00	173	.27	.25	.01	1268.
0.00	0.00	174	.27	.25	.01	1297.
0.00	0.00	175	.27	.25	.01	1329.
0.00	0.00	176	.27	.25	.01	1362.
0.00	0.00	177	.27	.25	.01	1395.
0.00	0.00	178	.27	.25	.01	1427.
0.00	0.00	179	.27	.25	.01	1456.
0.00	0.00	180	.27	.25	.01	1483.
0.00	0.00	181	.16	.15	.01	1504.
0.00	0.00	182	.32	.31	.01	1521.
0.00	0.00	183	.32	.31	.01	1535.
0.00	0.00	184	.48	.47	.01	1550.
0.00	0.00	185	.56	.55	.01	1573.
0.00	0.00	186	1.37	1.36	.01	1628.
0.00	0.00	187	2.26	2.24	.01	1758.
0.00	0.00	188	.89	.87	.01	1973.
0.00	0.00	189	.56	.55	.01	2265.
0.00	0.00	190	.48	.47	.01	2634.
0.00	0.00	191	.32	.31	.01	3058.
0.00	0.00	192	.32	.31	.01	3462.
0.00	0.00	193	.25	.23	.01	3779.
0.00	0.00	194	.25	.23	.01	3979.
0.00	0.00	195	.25	.23	.01	4062.
0.00	0.00	196	.25	.23	.01	4039.
0.00	0.00	197	.25	.23	.01	3914.
0.00	0.00	198	.25	.23	.01	3726.
0.00	0.00	199	.25	.23	.01	3490.
0.00	0.00	200	.25	.23	.01	3216.
0.00	0.00	201	.25	.23	.01	2942.
0.00	0.00	202	.25	.23	.01	2706.
0.00	0.00	203	.25	.23	.01	2508.
0.00	0.00	204	.25	.23	.01	2345.
0.00	0.00	205	.19	.18	.01	2210.
0.00	0.00	206	.19	.18	.01	2094.
0.00	0.00	207	.19	.18	.01	1991.
0.00	0.00	208	.19	.18	.01	1899.
0.00	0.00	209	.19	.18	.01	1818.
0.00	0.00	210	.19	.18	.01	1740.
0.00	0.00	211	.19	.18	.01	1668.
0.00	0.00	212	.19	.18	.01	1601.
0.00	0.00	213	.19	.18	.01	1540.
0.00	0.00	214	.19	.18	.01	1485.
0.00	0.00	215	.19	.18	.01	1436.
0.00	0.00	216	.19	.18	.01	1393.
0.00	0.00	217	.01	.00	.01	1352.
0.00	0.00	218	.01	.00	.01	1310.
0.00	0.00	219	.01	.00	.01	1263.
0.00	0.00	220	.01	.00	.01	1207.
0.00	0.00	221	.01	.00	.01	1136.
0.00	0.00	222	.01	.00	.01	1050.
0.00	0.00	223	.01	.00	.01	953.
0.00	0.00	224	.01	.00	.01	851.
0.00	0.00	225	.01	.00	.01	747.
0.00	0.00	226	.01	.00	.01	646.
0.00	0.00	227	.01	.00	.01	551.
0.00	0.00	228	.01	.00	.01	464.
0.00	0.00	229	.01	.00	.01	387.
0.00	0.00	230	.01	.00	.01	321.
0.00	0.00	231	.01	.00	.01	268.
0.00	0.00	232	.01	.00	.01	225.
0.00	0.00	233	.01	.00	.01	198.
0.00	0.00	234	.01	.00	.01	185.
0.00	0.00	235	.01	.00	.01	172.
0.00	0.00	236	.01	.00	.01	161.
0.00	0.00	237	.01	.00	.01	150.
0.00	0.00	238	.01	.00	.01	140.
0.00	0.00	239	.01	.00	.01	131.
0.00	0.00	240	.01	.00	.01	122.
0.00	0.00	241	.01	.00	.01	114.
0.00	0.00	242	.01	.00	.01	106.

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HYDROGRAPH ROUTING

ROUTE DISCHARGE THROUGH MISHE MOKWA LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-70.	-1

STAGE	70.10	70.20	70.40	70.60	70.80	71.00	71.20	71.40	71.60	71.80
	72.00	72.20	72.40	74.00						
FLOW	0.00	.30	2.40	8.70	18.00	29.00	42.00	105.00	208.00	338.00
	490.00	658.00	844.00	2632.00						
SURFACE AREA=	0.	48.	58.	71.						
CAPACITY=	0.	130.	193.	263.						
ELEVATION=	62.	70.	71.	72.						

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
70.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
72.4	2.6	1.5	165.

STATION DAM, PLAN 1, RATIO 1 (1/2 PMF)

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
2.	2.	3.	4.	5.	7.	8.	10.	13.	15.
18.	21.	24.	28.	31.	36.	40.	51.	71.	90.
111.	140.	168.	195.	224.	255.	285.	314.	342.	373.
402.	429.	455.	479.	503.	528.	554.	585.	624.	675.
741.	820.	924.	1046.	1166.	1275.	1367.	1437.	1485.	1510.
1514.	1501.	1475.	1441.	1407.	1360.	1316.	1272.	1229.	1186.
1144.	1104.	1064.	1027.	991.	957.	926.	896.	868.	841.
819.	796.	770.	742.	712.	680.	647.	615.	582.	549.
516.	484.	455.	427.	401.	377.	353.	332.	314.	297.
281.	265.	250.	236.	223.	210.	200.	191.	182.	174.
166.	158.	150.	143.	136.	129.	123.	117.	111.	106.
102.	99.	96.	93.	90.	87.	84.	81.	79.	76.
74.	71.	69.	67.	64.	62.	60.	58.	56.	54.
52.	51.	49.	47.	46.	44.	43.	42.		

STORAGE

130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	130.	130.	130.	130.	130.
130.	130.	130.	130.	130.	131.	131.	131.	131.	132.
132.	132.	132.	133.	133.	133.	134.	134.	134.	134.
135.	135.	135.	136.	136.	136.	137.	137.	137.	137.
138.	138.	138.	139.	139.	139.	140.	140.	141.	141.
142.	144.	145.	147.	149.	151.	154.	156.	159.	162.
165.	168.	171.	175.	176.	182.	185.	189.	192.	196.
199.	203.	206.	209.	212.	215.	218.	221.	223.	226.
226.	231.	233.	235.	237.	239.	241.	244.	247.	251.
256.	261.	268.	274.	281.	286.	291.	294.	297.	298.
298.	297.	296.	294.	292.	290.	288.	286.	284.	282.
280.	277.	275.	273.	271.	270.	268.	266.	265.	263.
261.	260.	258.	256.	253.	251.	248.	246.	243.	241.
238.	235.	233.	231.	228.	226.	224.	223.	221.	219.
218.	216.	215.	213.	212.	211.	210.	209.	208.	207.
206.	205.	204.	203.	202.	201.	201.	200.	199.	199.
198.	198.	197.	196.	196.	195.	195.	194.	194.	193.
193.	192.	192.	192.	191.	191.	190.	190.	190.	189.
189.	189.	188.	188.	188.	188.	187.	187.		

```
                                        STAGE
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1      70.1
70.1      70.2      70.2      70.2      70.2      70.2      70.2      70.2      70.2      70.2
70.2      70.2      70.2      70.2      70.2      70.2      70.2      70.2      70.3      70.3
70.3      70.3      70.3      70.3      70.3      70.3      70.3      70.3      70.3      70.3
70.4      70.4      70.4      70.5      70.5      70.5      70.6      70.6      70.7      70.7
70.8      70.9      70.9      71.0      71.0      71.1      71.2      71.2      71.3      71.4
71.4      71.5      71.5      71.6      71.6      71.7      71.7      71.8      71.8      71.8
71.9      71.9      72.0      72.0      72.0      72.0      72.1      72.1      72.2      72.2
72.3      72.4      72.5      72.6      72.6      72.7      72.8      72.8      72.9      72.9
72.9      72.9      72.8      72.8      72.8      72.8      72.7      72.7      72.7      72.7
72.6      72.6      72.6      72.5      72.5      72.5      72.5      72.4      72.4      72.4
72.4      72.3      72.3      72.3      72.3      72.2      72.2      72.1      72.1      72.1
72.0      72.0      72.0      71.9      71.9      71.9      71.8      71.8      71.8      71.7
71.7      71.7      71.7      71.6      71.6      71.6      71.6      71.6      71.5      71.5
71.5      71.5      71.5      71.5      71.5      71.4      71.4      71.4      71.4      71.4
71.4      71.4      71.4      71.4      71.4      71.3      71.3      71.3      71.3      71.3
71.3      71.3      71.3      71.3      71.3      71.3      71.3      71.3      71.2      71.2
71.2      71.2      71.2      71.2      71.2      71.2      71.2      71.2
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SUMMARY OF DAM SAFETY ANALYSIS

.....		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	70.10	70.10	72.40
	STORAGE	130.	130.	263.
	OUTFLOW	0.	0.	844.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	72.87	.47	298.	1514.	2.25	16.75	0.00
.40	72.63	.23	280.	1147.	1.50	16.75	0.00
.30	72.33	0.00	258.	777.	0.00	16.92	0.00
.20	71.93	0.00	232.	440.	0.00	17.08	0.00
.10	71.42	0.00	200.	113.	0.00	18.42	0.00

AD-A068 674 NEW JERSEY STATE DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/2
NATIONAL DAM SAFETY PROGRAM. MISHE - MOKWA DAM (NJ 00419), DELA--ETC(U)
MAY 79 R J MCDERMOTT DACW61-78-C-0124

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2 OF 2
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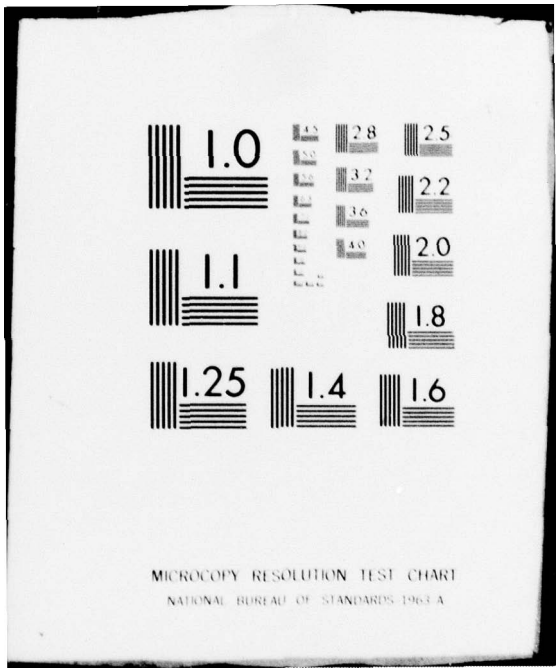
1.0
1.1
1.25
1.4
1.6
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.8
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

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A1                                   NATIONAL DAM SAFETY PROGRAM
A2                          MISHE MOKWA DAM                    NEW JERSEY
A3                              0.5 PMF BREACH DOWNSTREAM ROUTING
3     150          0          5                                    0         0         3
31      5
J       1          1          1
J1    0.5
K       0       LAKE                                            0         0         1
K1                          INFLOW HYDROGRAPH TO MISHE MOKWA LAKE
M       1          2       0.83                 0.83         0                              1
O       0       26.5        100        109       117
T                                                                        1.5      0.15
W2                0.72
X    -1.0      -0.05        2.0
X       1        DAM                                            0         0         1
X1                      ROUTE DISCHARGE THROUGH MISHE MOKWA LAKE DAM
Y                                          1         1
Y1      1                                                                -70.1        -1
Y4   70.1       70.2       70.4       70.6      70.8      71.0      71.2      71.4      71.6      71.8
Y4   72.0       72.2       72.4       74.0
Y5      0        0.3        2.4        8.7        18        29        42       105       208       338
Y5    490        558        844       2632
$A      0       48.0       57.6       70.5
$E     62       70.1       71.3       72.4
$$   70.1
$D   72.4       2.63        1.5        165
$3   45.0        1.0       61.0          1      70.1      72.4
K       1          1                                                        1
K1                                  CHANNEL ROUTING REACH 1
Y                                          1         1
Y1      1
Y5   .05        .04        .05         59        72       300      .001
Y7      0         72        300         64       500        62       650        59       750        59
Y7    780         62        860         72       900        72
K       1          2                                                        1
K1                                  CHANNEL ROUTING REACH 2
Y                                          1         1
Y1      1
Y5   .05        .04        .05         59        72       700      .001
Y7      0         82        300         72       400        62       450        59       550        59
Y7    600         62        900         72       950        72
K      99
A
A
A
A
A
```

SUMMARY OF DAM SAFETY ANALYSIS

1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	70.10	70.10	72.40
STORAGE	130.	130.	263.
OUTFLOW	0.	0.	844.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	72.64	.24	280.	4935.	.60	17.08	16.08

PLAN 1 STATION 1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	4710.	65.2	17.17

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	4672.	65.5	17.17

APPENDIX 5

Bibliography

1. "Recommended Guidelines for Safety Inspection of Dams," Department of the Army, Office of the Chief of Engineers, Washington, D.C.20314.

2. Design of Small Dams, Second Edition, United States Department of the Interior, Bureau of Reclamation, United States Government Printing Office, Washington, 1973.

3. Holman, William W. and Jumikis, Alfreds R., Engineering Soil Survey of New Jersey, Report No. 20 Burlington County, Rutgers University, New Brunswick, N. J. 1953.

4. "Geologic Map of New Jersey" prepared by J. Volney Lewis and Henry B. Kummel, dated 1910 - 1912.

5. Urban Hydrology for Small Watersheds, Technical Release No. 55, Engineering Division, Soil Conservation Service, United States Department of Agriculture, January 1975.

6. Herr, Lester A., Hydraulic Charts for the Selection of Highway Culverts, U.S. Department of Transportation, Federal Highway Administration, 1965.

7. Safety of Small Dams, Proceedings of the Engineering Foundation Conference, American Society of Civil Engineers, 1974.